NEW ZEALAND
JOURNAL OF
Agriculture

APRIL · · · 1949

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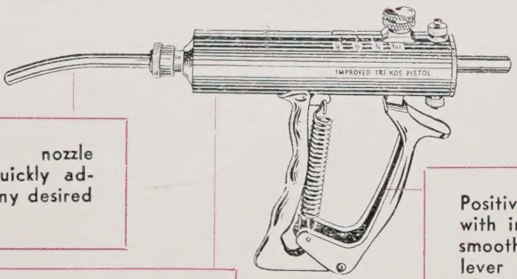

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Volume 78
Number 4
April 15,
1949.
(Established 1910)

NEW ZEALAND JOURNAL OF Agriculture

Published by
Direction
of
Hon. E. L. Cullen,
Minister of Agriculture.

This month's cover

A hill-country shepherd with his horse and dog is the subject of this month's cover, which was painted by J. Kenyon and is based on a photograph taken by National Publicity Studios on Esk Head station, a high-hill-country run in the Hawarden district, North Canterbury. Though New Zealand's primary production is commonly believed to come mostly from the flat country, the contribution made by hill-country runs and farms is very important. The bulk of the wool clip is produced on hill-country holdings, which by providing store sheep and cattle for lowland farmers also form the basis of the Dominion's meat production. There is little doubt that if certain technical and economic problems connected with topdressing and oversowing with clovers can be overcome, this type of land has remarkable potentialities.

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SUBSCRIPTION RATES

The "Journal" is issued monthly. The subscription within New Zealand is 2s. 6d. a year; the overseas subscription is 5s. The "Journal" may be ordered from any bookseller or newsagent, or direct from any office of the Department of Agriculture. Individual copies are available at 3d. a copy, post free.

REGISTERED AT THE G.P.O., WELLINGTON, AS A MAGAZINE.

VARIED FARMING IN WAIMEA COUNTY, NELSON

HOP PICKING

APPLE ORCHARDS AT TASMAN

RASPBERRY PICKING

HARVESTING APPLES

PREPARING TOBACCO LEAVES FOR DRYING

Probably nowhere in New Zealand is farming as diversified as it is in Waimea County in the Nelson Land District. Having a climate well suited to horticulture, the county has become the centre of the Dominion's tobacco- and hop-growing industries and holds a leading position as a pip-fruit-growing district. Tomatoes, small fruits, and market garden crops are grown extensively and, together with sheep and dairy farming, contribute largely to the value of the county's primary production. The harvesting of most of the horticultural crops gives rise to a large seasonal demand for labour, a large proportion of which is drawn from all parts of New Zealand.

[Upper right photograph by Neuline Film Studios Ltd.; middle left, A. R. Kingsford; middle right and lower left, National Publicity Studios.

VALUE OF AGRICULTURAL SHOWS

I ALWAYS count visits to agricultural and pastoral shows among the most pleasant, and certainly among the most instructive, of the duties associated with my portfolio. Though I have not been able to attend all the fixtures to which I have been invited, I have seen a number of excellent shows in both the North and South Islands during the past season. Viewed in retrospect they were impressive exhibitions of this Dominion's wealth of livestock and they bore the stamp of that high degree of organisation which has placed our agriculture on such a high plane.

Unquestionably the agricultural show is a most effective educative medium and it has the advantage that it provides for the farming community a most attractive blending of business and pleasure. During the war show associations, in common with many similar bodies, were faced with a very difficult period and fixtures had to be curtailed heavily. I have been most impressed with the manner in which, with enthusiasm and energy, show committeemen have tackled the job of re-establishing their annual shows. Despite many difficulties, they have unquestionably succeeded in restoring these popular fixtures to their former high standard.

New Zealand's wealth has been built largely on its progressive livestock industry, and agricultural shows provide the people of New Zealand, farmer and townsman alike, with an opportunity of seeing the fine quality of stock on which the industry is based. The keener observer, too, will be able to watch the progress which has been made in selection and breeding and by improved general farm-management practices.

The New Zealand farmer has always been ready to accept new methods for speeding up production—his early acceptance of the milking machine, the farm separator, and the shearing machine are evidence of this—and today mechanisation has reached an advanced stage on most farms. Between the immediate pre-war years and the present time the number of agricultural tractors alone has doubled. For many years displays of farm machinery have been a feature of agricultural shows and the comprehensive range of implements assembled presents farmers with the opportunity for inspecting a wide variety of machines in a comparatively-short time. There is the advantage, too, that machinery manufacturers and agents become acquainted with a multitude of inquiries concerning the particular implements which farmers require, and they may in this way plan production of still more effective machinery.

The great advances made in all branches of farming in New Zealand in the country's comparatively-short history have been materially assisted by the sound and progressive advisory services. Farmers have always looked to those services to provide the answer to production problems, with the result that today research and advisory services cover a very wide field. Most of these are well known, and judging from appreciative remarks made to myself and my officers the Department of Agriculture exhibit which has been staged at shows during the past season has been viewed with keen interest. I am fully aware of the value of such exhibits and will see that every effort is made to stage the display at as many shows as possible.

Townspeople, just as eagerly as those who earn their living on the land, look foward to their annual district show, and there is no doubt that such shows provide a most valuable community of interest in work on the land. It is probably true that in New Zealand urban dwellers are less divorced from matters connected with primary production than are city dwellers in many other countries with an extensive farming industry. Towns in New Zealand have grown rapidly, but the agricultural show has provided that desirable close liaison between town and country activities.

Attendance figures for agricultural shows during the past season confirm the popularity of these fixtures and justify the vigorous efforts made to regain the ground unavoidably lost during the years when New Zealand was at war and the farming community's overriding consideration was to see that every ounce of food went to the armed forces and to our kinsfolk in Great Britain. Today, in an unstable world, the call for food is no less urgent and the products of our great livestock industries appear to be in ever-increasing demand. The progress made in those industries is well displayed at our agricultural shows.

One feature which particularly impressed me during the visits I made to shows was the keen and intelligent interest displayed by young exhibitors and junior officials. There is no doubt that the Federation of Young Farmers' Clubs and the Boys' and Girls' Agricultural Clubs are doing fine work in this connection, and I would suggest to show associations that they do all in their power further to stimulate the interest taken by these young people. From their ranks will come the future exhibitors of champions, the efficient judges of tomorrow, and the executive officers to whom will fall the task of adding to the already impressive record of New Zealand's agricultural and pastoral show associations.

Last season Agricultural and Pastoral Associations had a record of well-merited successes. I hope that they will continue their important work with the enthusiasm they have shown in the past and that they will be rewarded by larger entries, better attendances, and still keener interest in the work they do on behalf of our paramount industry.

EDWARD CULLEN, Minister of Agriculture.

Purchase of Fertilisers and Non-registerable Mixtures

FARMERS and other users are advised to consider carefully the restricted extent to which the law protects them in their purchase of fertilisers. The law in New Zealand seeks to safeguard the purchaser only in respect of the three elements in which soils are most frequently deficient—nitrogen, phosphorus, and potassium. This article by J. E. Bell, Fields Superintendent, Department of Agriculture, Auckland, explains the precautions which should be taken before purchasing non-registerable mixtures.

THE Fertilisers Act defines a "fertiliser" as: ". . . any substance used for enriching the soil and in a state suitable and intended for application to the land, and which contains in appreciable amount nitrogen, phosphoric acid, or potash; it does not include lime, nor stable manure, or any crude refuse which has not been dried or so treated that decomposition is arrested until applied to the land."

Commodities coming within the definition set out in the Act, if sold in lots of 5cwt. or more, must be registered and sellers must furnish invoice certificates giving details of the composition of the fertiliser supplied. Official samples are taken for analysis periodically and, if there is any deficiency beyond the prescribed limits of tolerance, the vendor is liable to prosecution.

Calcium, the fourth element in which New Zealand soils are most commonly deficient, is not covered by legislative safeguards in this country, but prospective buyers of agricultural lime can protect themselves by asking vendors to produce copies of analysis reports. The Lime Transport Assistance subsidy is not granted to vendors of agricultural lime whose product does not contain a reasonable percentage of carbonate of lime—usually about 70 per cent.—or is not ground to a satisfactory degree of fineness.

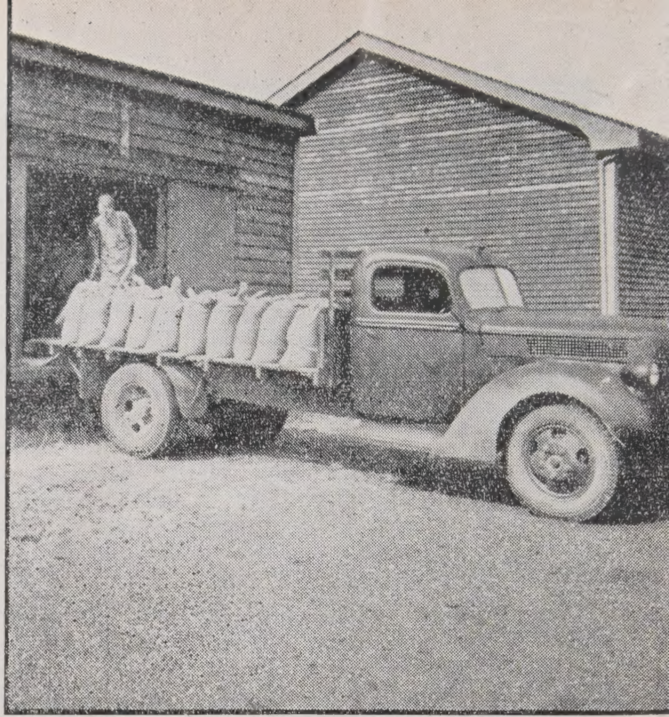
"Minor Elements"

Though the four elements in which New Zealand soils are most generally deficient are thus adequately provided for, it would be impracticable, and indeed unwise, to attempt to legislate over all substances concerned with plant growth and animal health. Thus there is a wide variety of materials which are not subject to control. Chief among these are the so-called "minor elements," which on certain soil types may be vital to the health of stock, or essential for successful pasture or crop production. The need for cobalt on bush-sick land is well known, as also is the value of boron for preventing brown heart in swedes, corky pit in apples, and various other troubles. Other elements that have been shown to have value under certain conditions include copper, molybdenum, magnesium, and manganese.

But the use of many of these minor elements in excess leads to just as much trouble as does deficiency of them. For instance, excess of copper or of molybdenum in pasture can be fatal to stock, while borax, which is a compound of boron, is sometimes used, in heavy dressings, as a weedkiller.

The list of minor elements known to be necessary for normal plant and animal growth is expanding, and the knowledge of how and where to use these materials is far from complete. Obviously, then, it would be impracticable at this stage to bring these elements within the scope of the Fertilisers Act.

Under the existing law a vendor does not commit an offence if he markets, without registration, a mixture of various substances, useful or worthless, but not including appreciable amounts of nitrogen, phosphoric acid, or potash, provided he does not describe it specifically as a "fertiliser". It is therefore not surprising that there are usually on the market a few preparations variously described as topdressers, topdressing mixtures, mineral mixtures, mineral plant foods, etc., which have very little fertiliser value, or which may be sold at prices out of all proportion to their real value. These preparations invariably contain substantial percentages of cheap materials which are readily available to the farmer who wishes to test them.



[*Sparrow Industrial Pictures Ltd. photo.*

The value of a fertiliser, or of a mixture purporting to be a fertiliser, can be estimated in almost every case by a study of the chemical composition of the material. A farmer who is offered a mixture of lime and salt at a price far in excess of the cost of the two materials will know how to act. However, the Department of Agriculture must consider the possibility of some of the ingredients included in non-registerable mixtures having fertilising value under certain conditions, and thorough tests must be carried out before the Department can state its opinion.

Salt, sulphur, coal dust, and iron ore have been sold for pasture topdressing; the Department of Agriculture cannot say that these substances have never had the effect of raising grassland and stock production, but official trials have shown that the materials are, for all practical purposes, worthless for improving such production.

Time Lag

It usually takes about 6 years for an unsatisfactory product to exhaust its market. One reason for this time lag is that purchasers are usually advised to mix or apply the product with superphosphate or some other useful fertiliser, so that it becomes difficult to assess the worth of the product; another reason is that the Department of Agriculture has followed a policy of suspending judgment on any new product until it has carried out a series of field trials under varying soil conditions. It is necessary to collate information from chemical analyses of soils, pastures, and the product concerned, and from the results of pot trials and simple and complex experiments in the field. To complete this procedure takes considerable time, but farmers would be well advised to wait until the investigation has been made and to avoid using new products until competent research has established their proper place in agriculture.

When considering purchasing a fertiliser the farmer should ask himself:—

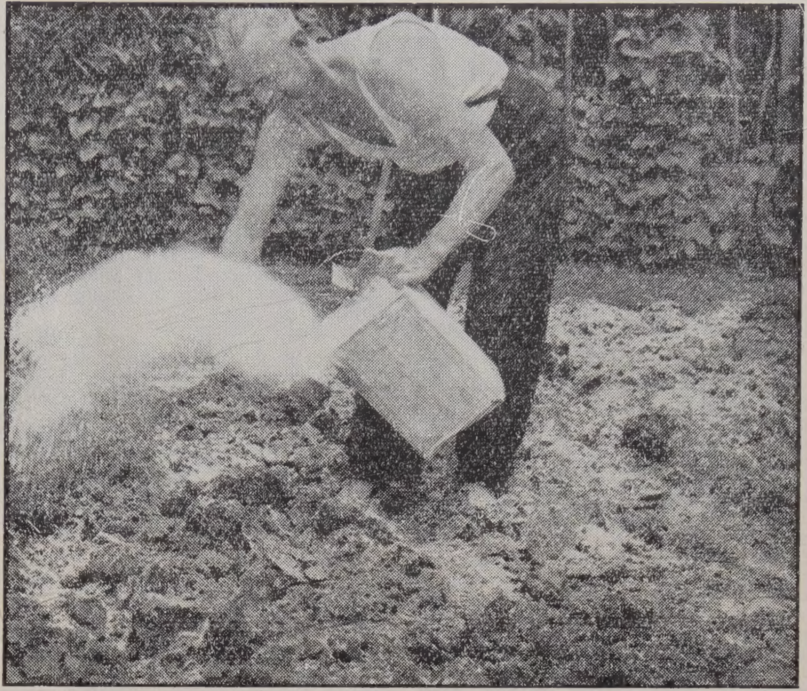
What is the composition of the material?
Is it likely to increase growth?
What is the real cost of the ingredients?

Almost every non-registerable mixture that is, or has been, on the market is composed of common materials readily available to the farmer. If the farmer wants to test the mixture on his farm, it is therefore possible for him to do so at a cost usually much below that asked for the non-registerable mixture. If the vendor is unwilling to supply details of the analysis with the material, the farmer would be foolish to pay a high price for an unspecified product. In any case information as to the probable merits of the material can be obtained from the local Instructor in Agriculture.

Little Growth can be Expected in Home Gardens in May

By A. G. KENNELLY, Vegetable Instructor, Department of Agriculture, Christchurch.

GROWTH in gardens is greatly reduced in May. In most districts only hardy vegetables such as the cabbage family, leeks, turnips, carrots, and parsnips continue to develop fairly strongly. Garden work is confined largely to harvesting and clearing off the residue of half-hardy crops such as beans, tomatoes, marrows, pumpkins, and potatoes.



[*Sparrow Industrial Pictures Ltd. photo.*

Ground left vacant after harvesting of a crop can be dug and sown with a green crop or limed.

SOME sowing and planting can be done, but discretion should be exercised. Comparatively-little growth can be expected in most gardens for the next 2 months and the home gardener must decide whether anything is to be gained by sowing or planting any but the hardiest subjects now. It is not advisable, however, to plant or sow even hardy subjects in cold districts where the soil is heavy and poorly drained. Temperatures and weather are not so favourable that the plants should be subjected to the additional hazard of a cold, wet soil if this can be avoided.

Cabbage and endive can still be set out and, where conditions are not likely to be too severe, lettuce and cauliflower as well. Broad beans and spinach can be sown and in some districts peas, but unless the garden is in an especially-favourable situation and climatic conditions are very good, it is best to defer sowing seeds of such subjects as carrots, onions, turnips, and even radish until July or later.

The top growth of asparagus should be cut down as soon as it commences to turn yellow, and the digging of the kumara and potato crop should be completed without delay. Potatoes and other root crops in store should where necessary be sorted over to remove rots. Vacant ground can be sown with a green crop or limed and attention given to the compost heap and to the burning of rubbish. The earthing up of celery and leeks should be completed and rhubarb beds weeded and the seed stalks removed.

Broad Beans

If drainage and soil conditions are good, broad beans can be sown from mid-April, though in many districts May is preferred, until early spring. As they are easy to grow and most varieties can be relied on to produce a good crop with very little attention, they deserve a place in the garden of every home where their flavour is appreciated. Moveover the earlier sowings usually mature at a time when vegetables are scarce and lacking in variety in most gardens.

They do not require special soil, but it is not advisable to sow them in a light soil which tends to dry out. They do well in fairly heavy, well-drained soil that has been thoroughly cultivated and into which has been dug a moderate supply of organic material such as compost or well-rotted farmyard manure. The ground should be deeply dug well before sowing. Though a small amount of potash is often beneficial, particularly on light soils or where disease is troublesome, the principal plant nutrient required is phosphoric acid. A dressing of 2 to 4oz. of superphosphate per square yard usually gives good results, though on poor soils a small amount of nitrogenous fertiliser and some potash may also be advisable. Apart from their food value phosphates have a stimulating effect on the nitrogen-fixing bacteria before the bacteria enter the root; that is, during the phase in their life cycle when they are capable of movement in the water films.

Beans will not thrive if the soil is sour, and if necessary, lime should be applied at the rate of at least 2 to 4oz. per square yard. It is best applied some time before sowing.

Though beans, apart from weed control, usually require little attention when young, it is advisable in winter or early spring when weather is boisterous to draw a little soil against the stems of autumn-sown plants. Tall-growing varieties can be stopped when they are about 3ft. to 3ft. 6in. high by pinching out the tops. This encourages the plant to develop sturdy growth and is often sufficient to check an early attack of black aphis, particularly if there are plenty of the aphis's natural enemies such as lacewing flies and ladybirds and their larvae about. In many gardens where tall varieties are grown it is advisable to support the plants as they develop or as they become heavy with pods. One or more strings run along the sides of the row and tied to stakes at intervals of 5 or 6ft. will save the plants from being blown over by wind.

Beans sown very early in autumn do not necessarily yield pods earlier than those sown somewhat later, for though the plants may make good growth in the late autumn and early winter, they are likely, particularly where winters are fairly severe, to be damaged and checked by disease or by boisterous weather. The earliest flowers often fail to set because they are produced at a time of unfavourable soil conditions and sudden extreme temperature changes and possibly also because there is little activity on the part of pollinating insects, though the flowers are normally mainly self pollinating.

Spring sowing should not be deferred too long, as the crop is liable to be greatly reduced if it matures in the hot, dry conditions of summer. If the seed is soaked for about 12 hours before sowing, germination is usually greatly speeded up.

THE HOME GARDEN IN MAY . . .

Types and Varieties

Two main types of broad bean are grown in New Zealand: The broad-podded or Windsor type and the long-podded type. The broad-podded type has relatively-short broad pods usually containing about 3 to 5 large seeds. It is represented by varieties such as Broad Windsor, Giant Windsor, and Harlington Windsor. Longpod and Mammoth Longpod are examples of the long-podded type, varieties of which may produce pods up to about 16in. long, though more generally they are about 5 to 9in. long and contain about 4 to 7 seeds. The Windsor type is usually considered to be of superior flavour, but the long-podded beans are hardier, yield more heavily, and are usually earlier.

Small-podded varieties are also sold by some seedsmen. They may be tall or dwarf. The tall varieties, for example, Tall Mazagan, are low yielding and are not recommended. Dwarf varieties, however, are well worth growing, particularly in small gardens or in exposed situations. They are also useful for sowing in January where conditions are not too hot and dry, or even in February where the growing period is long enough, to mature before winter. They are mainly classed as fan-podded and may be from about 9 to 15in. high. The pods contain 2 to about 4 small seeds and are largely in fan form. The foliage is small, often rather dark, and the internodes are very short. Examples of the type are Coles Early Dwarf and Dwarf Gem.

In Europe broad beans are also usually grouped according to whether the seeds are white or green. Many people there consider that the green-seeded kinds are more tender and tasty than the white. There are green-seeded and white-seeded kinds in the Windsor, long-podded, and small-podded groups.

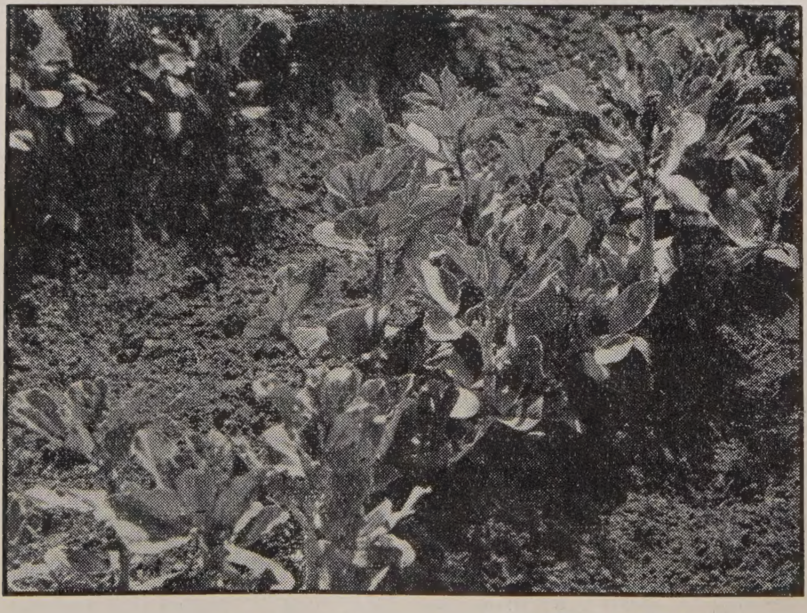
Red-seeded varieties were once fairly common and were regarded as a novelty. They are not listed by seedsmen now, though a fairly-good variety having reddish-brown seed has been noticed locally. Though the seed colour is not as attractive when cooked, the bean is not inferior in quality and in productiveness to some of the long-podded strains which it resembles in many of its characteristics. The seed is redder and larger than that of the very old early, though inferior, variety Dwarf Scarlet, which used to be listed in European seed catalogues.

It is not commonly known that the immature pods of broad beans are delicious and may be eaten whole if they are sliced in the way usually adopted for preparing runner beans for cooking; young broad beans are quite tasty used raw in salads if they are shelled and the seeds skinned. Skinning is not as difficult as it may seem and with the seed coat removed the beans are sweet and tender.

Beans are a good source of protein and iron and vitamins B_1 and B_2. They are a good energy food and help to meet the body's need for calcium and phosphorus. Their comparatively-high protein content, though not of the same quality as that of eggs or meat, makes them suitable substitutes for these foods. Iron, of which beans are a good source, is necessary to make blood.

Method of Sowing

Beans should be sown in double rows about 10in. apart with the seed placed diagonally 4 to 6in. apart and 2in. deep in the bottom of a trench 3in deep. Germination is usually good, but it is advisable to plant a few extra seeds at the ends of the rows to fill gaps. A quart of seed will sow about 50ft. of double row.



[*Green and Hahn Ltd. photo.*

Broad beans can be sown in most districts now. They are very hardy and should help to provide variety in meals in spring.

Chinese Artichoke

The Chinese or, as it is sometimes called, the Japanese artichoke is, like the Jerusalem artichoke, not a true artichoke. It is not often grown in home gardens in New Zealand, but the small, tender, curiously-jointed, almost corkscrew-like tubers it produces are generally considered by those who have tried them to have an agreeable flavour. They are watery and fine skinned and are occasionally fried or eaten in salads, though they are usually cooked and eaten in a similar manner to Jerusalem artichokes.

The plant is a hardy perennial with roots swollen at the ends into tubers. Propagation is usually by tubers, which are planted in early spring 4in. deep and 9 to 12in. apart in rows 18in. apart. The plant is easy to grow and usually does quite well even in comparatively-poor soil, though a moderately-rich or lightly-manured soil is best, as too much manure causes coarseness.

Seed can be sown in spring where tubers are not available. Tubers are produced late in the season when top growth is failing. When the foliage has died down the tubers should be lifted as required, because they deteriorate rapidly when exposed to the light and air. If it is necessary to lift them some time before they are required, they should be covered at once with soil or damp sand. After harvesting, no tubers should be left in the ground, as they are likely to prove a nuisance to succeeding crops.

Harvesting and Storing Kumaras

Because kumaras or sweet potatoes gain rapidly in total yield and the table quality of mature tubers is better than that of immature ones, home gardeners who grow them are usually tempted to leave the main crop to develop as long as possible. Where considerable quantities are grown and the tubers are stored, however, digging should be completed before there is risk of frost cutting down the tops. Even if it is not intended to store the tubers and an unusually-early frost kills the tops, it is advisable to remove them promptly, as rots developing in the foliage sometimes penetrate to the tubers.

Sweet potatoes are injured when the temperature falls to 40 degrees F. (8 degrees above freezing point) and the keeping quality is so seriously affected that long storage is usually impossible. For best results the tubers should not be subjected to temperatures below 50 degrees F. If they are carefully harvested and properly cured and stored, it should be possible to keep them until next season's crop is ready, but if digging is delayed until after a frost and the tubers are left for several days in wet, cold soil, the loss in storage may ultimately be very high. Even a few days at 40 degrees F. may cause discoloration, and if the tubers are set to grow shoots for cuttings, poor sprouting is likely to result.

Sweet potatoes for storage should be mature. Tubers are mature when the skins are reasonably firm, though they can also be tested by cutting. When cut, mature tubers dry rapidly and cleanly on exposure to the air.

Before digging sweet potatoes the vines should be carefully cut off near the crown. Great care should be taken not to injure the tubers when they are being dug, because if they are only slightly damaged, they will not keep and should be put aside for immediate use. The delicate skins are easily damaged in digging or in tossing the tubers into heaps; even if the sides of the containers are rough, the tubers can be spoilt.

Importance of Proper Curing

Apart from the care necessary in lifting and storing, it is essential that sweet potatoes are properly cured before storing. In New Zealand curing of a kind is usually done by gathering the tubers into heaps and leaving them for about a week, covering them during rain or at night with their vines or old sacks. Where temperatures are sufficiently high quite fair results are usually obtained from this method. By the time the tubers are ready for storage damaged ones which may have been overlooked have commenced to decay and can be rejected.

If tubers are to be properly cured in the field, they should be subjected to temperatures of not less than 70 degrees F. and fairly high relative humidity day and night for as long as 3 to 4 weeks or more. Such long curing is not usually a practical proposition in New Zealand, however, because of the need to grow the plants for as long as possible. Curing for too long may also result in excessive sprouting.

Research workers in the United States Department of Agriculture have proved how important curing is, not only to the longevity of the tubers, but also to their quality. Curing is not just sweating or drying. A properly-cured tuber may lose up to 10 per cent. in weight, but it should have almost the same relative amount of dry matter after curing as before. Quality, however, will be better because of the rapid change of much of the starch to dextrose and sugar.

It is rarely possible for the home gardener to cure his sweet potatoes under ideal conditions. It is difficult even for the commercial grower unless large quantities are grown and stored, as a strict routine must be followed.

The only method that will ensure that the quality of the tubers remains at its best from one harvest to another is to handle them with care, reject badly-damaged ones, subject the remainder to a period of fairly high temperatures and humidity to cure them and enable wounds to heal, and then to store them under conditions of scrupulous hygiene at a temperature of not less than 50 degrees F.

Curing with artificial heat should take only about 10 to 20 days if temperature and humidity are high enough. Both should be strictly controlled and a wet- and dry-bulb thermometer is essential. Best results are obtained if the tubers are subjected to a temperature of 85 degrees F. with relative humidity of 80 to 85 per cent. Curing should then take about 10 days. Temperatures below 85 degrees F. are not generally recommended, as the time taken to cure the tubers is too great. If the temperature is as low as, say, 70 degrees F., curing may take 30 or more days and the tubers may commence sprouting. After curing, the temperature should drop below 60 degrees F. as rapidly as possible and remain at 50 to 55 degrees F., with relative humidity at 80 to 85 per cent. Ventilation should not be necessary unless there is considerable condensation of moisture. Correct temperature and humidity will greatly reduce loss caused by shrinkage. American experiments have shown that sorting over in storage is not effective in the United States in reducing losses through rots, as handling spreads disease-producing organisms which are usually present.

[Green and Hahn Ltd. photo.

Further growth from yams is now unlikely, as they are frost-tender perennials and finish growing after the first severe frost.

Healing of Wounds

Few diseases which cause rots in sweet potatoes attack the tubers through the unbroken skin and therefore loss in storage can be greatly reduced by careful harvesting and handling. Even with careful handling, however, there must inevitably be two wounds on each tuber, one at either end. These wounds afford suitable conditions of entry for disease-producing organisms unless they are enabled to heal and the tuber is properly cured. Wounds heal by the formation of a layer of wound-cork, which can be seen only through a microscope and which is formed under the dried surface tissue. This wound-cork is highly resistant to penetration by organisms causing rots.

Healing is most rapid at a temperature of 82 degrees F., with relative humidity of 92 per cent.; at 80 to 85 degrees F. and with a relative humidity of 85 per cent. healing begins the third day and proceeds rapidly. Healing is very slow when the air becomes as dry as 66 per cent. relative humidity, even though the temperature is high; at 50 per cent. relative humidity loss may be two to three times as much as it is at 80 per cent. Though tubers can be left out in the sun and wind for an hour or two, exposure to these elements will not necessarily heal wounds; only exposure to the right temperature and humidity will do that.

Where small quantities are being stored a reasonably warm shed or cellar is usually suitable if the tubers are placed in dry sawdust or dry sand. Deep placement in dry sand will prevent rats from getting to them. Alternatively, they can be wrapped in paper or covered with straw. Where larger quantities are stored a pit or bank similar to that used for potatoes is occasionally used, though it is not generally recommended. A pit may be satisfactory if it is well made and insulated against cold and wet and there is room for a person to move about in it. It should be clean and vermin-proof. Rats and mice not only eat the tubers, but spread diseases which cause rotting. Lined storage places, bins, containers, etc,, that are used year after year should be sprayed with a suitable fungicide before use. Copper sulphate at the rate of ½lb. to about 12 gallons of water makes a suitable spray.

Jerusalem Artichoke

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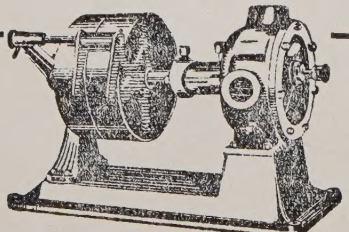

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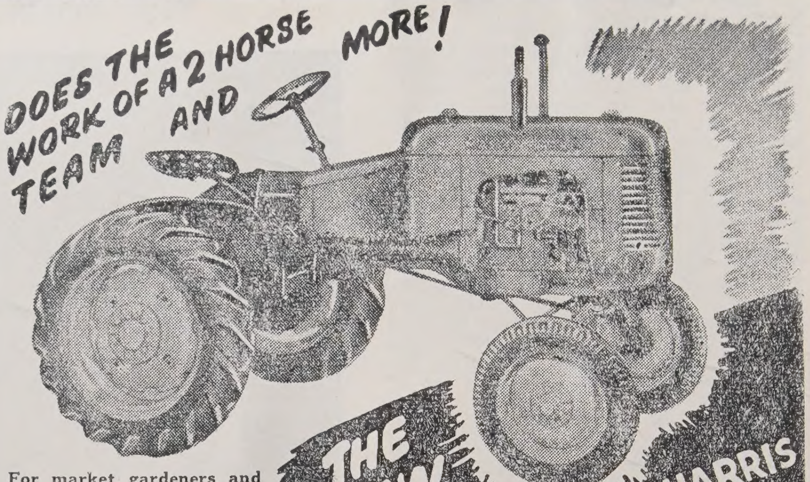
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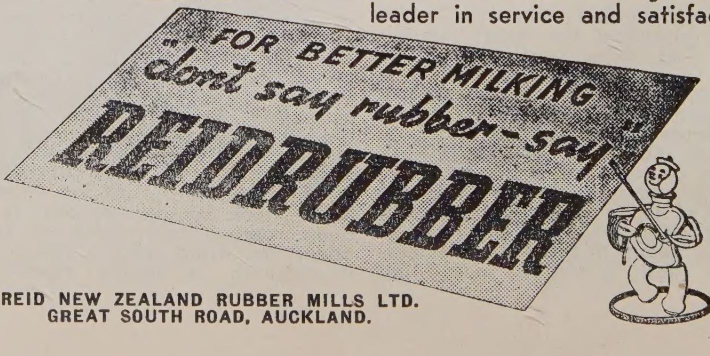
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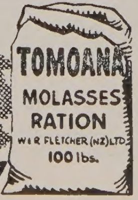
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Salsify, sometimes known as vegetable oyster, should now be ready for harvesting in home gardens.

unlike knobby potatoes, but they require a different method of cooking and have a high nutritive value. The flavour is rather sweet and when the vegetable is properly prepared for the table it is relished by many people. Artichokes respond well to liberal manuring and in good conditions they produce heavy crops of tubers and tops up to 10ft. high. The top growth is also quite useful for shelter if the situation is not too exposed. When digging, care should be taken to ensure that all tubers and pieces of tuber are removed; otherwise they will start into growth to the detriment of the succeeding crop.

Leeks

Cold weather checks leeks less than most other crops and good growth can still be expected where the ground is well drained and rich in plant nutrients. Liquid manure should be applied where the soil is poor, though plants that have already developed well can now be earthed up to lengthen and whiten the stems.

Peas

Peas can be sown now if soil and climatic conditions are likely to remain favourable. Where drainage is poor or winter conditions severe sowing is best deferred until July or August or even later.

Rhubarb

Though rhubarb is a strongly-growing plant, it is important to keep the beds free from weeds. Weed seedlings make strong growth in the rich soil which suits rhubarb, and regular weeding will ensure that weeds, particularly the perennial kinds such as couch, convolvulus, docks, and oxalis, are removed before their strongly-growing roots or stolons penetrate the soil immediately about the crowns and so become difficult to remove. When the bed is being forked over the soil can be dressed with organic manure.

Root Crops

In most districts root crops such as carrots, beetroot, parsnips, and swedes are best left in the ground unless the land is required for other crops or is liable to become so wet that rots may develop or digging become difficult. Some varieties of beetroot are susceptible to damage from severe frost, but in most districts no harm to any of these vegetables from frost or environment need be expected if the soil is well drained and not too heavy. Parsnips and swedes will in fact benefit from frost. Should digging be necessary, roots can be stored in sand or clean coal ash in a shed or cellar or stacked in a box sunk in well-drained ground; swedes usually keep well even if they are not "plunged." Cool and reasonably moist conditions are necessary for the storage of practically all root crops, but care should be taken to ensure that only sound roots are put in storage.

Salsify

Salsify is sometimes known as the vegetable oyster, because the flavour suggests, but does not otherwise resemble, the flavour of the oyster. It is often grown as a substitute for the parsnip, as its culture is somewhat similar. Roots should be ready now for harvesting, and can be prepared for the table by washing and cutting a small piece off the ends of each stalk and then scraping them lightly and boiling them for 30 to 40 minutes until they are tender in water containing a little vinegar or lemon juice and salt. They should then be served with white sauce.

Alternatively, they can be prepared as the vegetable oyster by boiling the roots and then when cold cutting them in slices and frying them to a light golden brown, adding salt and pepper while they are cooking.

Spinach

One of the few subjects that can be sown in April in well-drained soil, even in most of the colder districts, spinach is generally conceded to rate highly as a health-giving vegetable. It is quick growing, maturing under favourable conditions in from about 40 to 55 days.

It is a useful vegetable for late-autumn sowing and is usually one of the first subjects for early-spring sowing. Because it is hardy when established under cool conditions, it can be sown throughout the winter in well-drained and well-cultivated soil that is not too heavy, provided the seedlings can establish themselves without being "lifted" by frost. It will grow at temperatures only slightly above freezing, though the optimum-growth temperature is somewhat higher. Though seed germinates at relatively-low temperatures (40 degrees F. or even lower), seedling emergence is usually delayed where there is frequent heavy rain. Germination is good at 50 to 60 degrees F., but the percentage decreases at higher temperatures.

Spinach can be classified in several ways according to whether the seed is round or prickly, whether the leaves of the plant are smooth or savoyed (crumpled), or the varieties are long standing or go to seed quickly. Most New Zealand seedsmen still class or sell spinach mainly as either prickly (seeded) or round (seeded), though because of the many very fine varieties produced by overseas plant breeders for specific purposes, the more frequent listing of named varieties suited to specific purposes is desirable. Prickly-seeded spinach is usually sold for winter use, as it is generally considered to be hardier than the round. Because it is considered by many to be longer standing, it is also very popular for summer use. This belief in the superiority of prickly-seeded spinach is not supported by the evidence of trials of different varieties of the two kinds, as it has now been clearly demonstrated that there are long and short-standing varieties of both round- and prickly-seeded spinach — either may be smooth or savoy leafed.

The habit of bolting to seed, which is an inherent factor present to a greater or less degree in all varieties, is encouraged by long days and high temperatures and for this reason summer sowing of even the relatively long-standing varieties is not advisable in certain districts; even the most suitable varieties will not germinate and grow well in hot, dry weather. When excessively-high temperatures are maintained for some time the edges of the leaves, particularly the older ones, turn yellow. Con-

[*Green and Hahn Ltd. photo.*

Harvestmen are common in many home gardens in late summer and autumn. Their diet is varied; they kill small insects, but to some extent are also scavengers.

tinued high temperatures usually result in the whole leaf turning yellow and the plant is then likely to die of root or collar disease.

Spinach thrives in cool conditions on a great range of moist, fertile, well-cultivated and well-drained soils. It is not tolerant of a high degree of soil acidity, and lime should be applied to most soils that have not been recently dressed, though too much lime may cause yellowing of the leaves because of a deficiency or unbalance of certain essential elements such as manganese or iron.

A good dressing of organic material such as well-rotted farmyard manure or compost is advisable on most garden soils, and as spinach is a leafy vegetable, extra applications of nitrogen may be supplied by liquid manure or a side dressing of nitrate of soda or sulphate of ammonia raked in along the line of row, but it should not touch the foliage. Liquid manure is preferable where conditions are inclined to be dry, as abundant moisture is essential for high yields and good quality; growth should be reasonably quick, as otherwise some varieties tend to be tough.

Seed should be sown thinly ½ to 1in. deep in rows 12in. apart. Plants can be thinned to four or five to 1ft. of row, though if sown thinly, thinning in the accepted sense is not essential unless conditions are dry or the soil is very poor; it can be confined to the removal of the young plants when large enough for use. In poor soil or in dry conditions crops that have been given generous spacing in the seedling stage usually "stand" much longer.

The virus disease mosaic sometimes causes reduction in yield, and resistant varieties such as the prickly-seeded Presto Blight Resistant and the shorter-standing Japanese Prickly and round-seeded varieties such as Virginia Savoy and Old Dominion have been developed.

Sweet Corn and Pop Corn

The refuse of sweet corn should now be cleared away. If it is not infested with insect pests, it can usually be composted, as it rots down quite well if mixed with sappy or nitrogenous material. Heavy stems are best chopped into short lengths and bruised by hammering. The cobs of sweet corn will be available in good condition in only a few districts because of weather and because of the fact that they quickly lose flavour and palatability after harvesting unless stored at very low temperatures. Pop corn will, however, remain in good condition if properly stored where the atmosphere is not too dry.

[*Green and Hahn Ltd. photo.*

A looper caterpillar. In gardens where it has been troublesome all old plants that are the resting places for the pupae should be destroyed.

Yam or Oka Plant

The plant commonly known as a yam in New Zealand is actually an oxalis. It can be grown in most districts, but it requires a warm situation to do well. It is a frost-tender perennial and is usually grown after the manner of potatoes. Tubers are produced in great abundance, but are rarely thicker than a hen's egg. As they do not swell until rather late in the season, digging is usually delayed until frost cuts the tops. Cold weather, however, checks growth and in most districts digging should be completed by May. The tubers of some strains have a somewhat acid taste when first dug, but quickly lose all acidity on exposure to the sun.

Looper Caterpillars

Looper caterpillars are often troublesome on such vegetables as dwarf and runner beans and on tomatoes. They are usually a nuisance in southern districts only in warm seasons. They are active caterpillars up to 1¼ to 1½in. long and arch their bodies and move by a looping motion. They can be controlled by spraying with arsenate of lead before the development of pods or the edible stage of the crop. Full-grown loopers are difficult to kill with most contact poisons, as they are very active and move away from sprayed or dusted areas. When well-established they can be hand-picked. Heavy dressings of derris have given good results against young loopers and DDT is also effective. At the end of the season all old plants that are resting places for the pupae should be destroyed.

Harvestmen

Harvestmen are to be seen in most home gardens in summer and autumn. Unlike spiders, to which they are related and which are recognised and valued as friends by the discerning gardener, harvestmen have no apparent economic importance. They are not true insects, but belong to a biological group part of which includes spiders, insects (creatures having bodies in three parts, three pairs of legs, and wings), centipedes, woodlice, millipedes, crabs, and crayfish.

Harvestmen are usually found in damp, shady situations and most species are more resistant to moderate cold than heat; they seem to be very dependent on moisture, and if they are not frightened, they usually move quickly into the shade if the sun shines on them. Like spiders, they grow by a periodic casting of their skin or exoskeleton, but, unlike spiders, many of which at the time of moulting have the power of regenerating limbs which have been lost, if they lose a leg, they do not grow another to replace it. This seems strange, as the legs are easily detached.

Harvestmen exist on a varied diet. They feed largely on the dead bodies of small insects or other creatures, but they also capture and kill small creatures which usually abound in damp undergrowth. They are not, however, well provided with weapons of attack. They have neither the poison fangs nor poison glands with which spiders are armed, but have a forceps-like projection at the front. For defence some species expel an odoriferous secretion either rapidly in a fine jet or more slowly so that a large droplet accumulates.

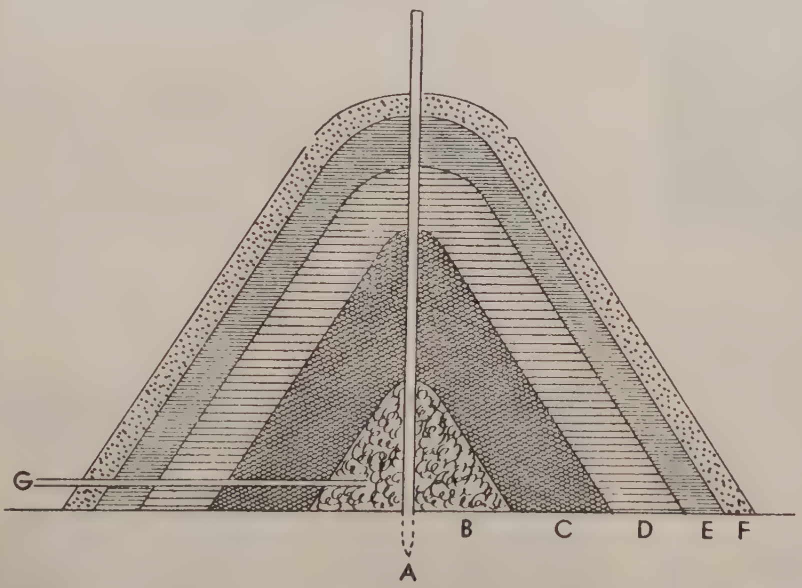
Value of Slow-burning Bonfires

Though every home gardener should compost or dig in as much garden trash as possible, there are certain materials even in the best-managed gardens that should be burnt. Most home gardeners know that wood ashes of the garden bonfire contain potash, which is a useful fertiliser in the garden, but the idea commonly held that the burning of rubbish that could be composted is a method of gaining something new is wrong. Burning is a wasteful process and what happens is that the useful organic or non-mineral matter is lost into the air in the form of a gas and only the mineral substance is left behind.

Wood ashes and the ashes of garden weeds are valued chiefly for their potash and lime content, though they generally contain to some extent in trace amounts silica, alumina, oxides of iron and manganese, lime, magnesia, potash (partly in the state of a silicate), soda, sulphates of potash and lime, phosphate of lime, chloride of sodium, and carbonates of lime, potash, and magnesia, together with some charcoal.

The potash content of garden ashes is mainly in the form of carbonate of potash and may range from about 1 to about 10 per cent. Lime content is also usually fairly high. Therefore, though the ashes of the garden fire, whether used at once or if stored under cover until required, make an excellent fertiliser, the loss of the valuable organic matter which includes nitrogen (the dry matter of plants may be composed of up to 15 per cent. of nitrogenous matter) is serious if the fire includes material that could be composted. However, old, useless wood or woody material, particularly if infested with pests or diseases, should be burnt, and because so many home gardeners find it difficult, either because of lack of skill or because of an insufficiency of material which breaks down easily, to build a compost heap in which the temperature quickly rises high enough to ensure the rapid destruction of all compostible material added to the heap, it is usually best to burn all material which harbours certain pests and diseases and also to burn the roots of most perennial weeds.

Because slow burning as the result of restriction in the amount of air or oxygen present gives a product which contains more carbon or charcoal (a valuable constituent of garden ash) than does burning in an open fire, and because in a properly-built, slow-burning fire there is an almost entire absence of smoke, it is well worth while where suitable materials are available for burning to build a slow-burning or "smother" fire. It should be built according to certain established principles, being banked with soil and having only a small air vent which will admit only enough air to enable combustion to proceed very slowly. A well-constructed heap may burn steadily for days or even weeks.



A slow-burning garden bonfire built as shown above should burn for about a week without giving off offensive smoke. The ash should have a relatively-high potash content. A—Iron bar or thick stake of green wood. B—Readily-inflammable material such as dry paper, straw, oily rag, dry leaves, etc. C—Small prunings, light, woody-material, twigs, etc. D—Woody material, branches, and large prunings. E—Perennial weed roots and plants infested with pests and diseases. F—Soil casing. G—Ventilation and lighting shaft facing into the direction of the prevailing breeze. In exposed positions where the wind is gusty or violent the vent is best placed on the sheltered side or burning may be uneven.

The value of charcoal in the garden has long been appreciated. Charcoal is a form of carbon with the power of absorbing gases and is sometimes used in purifying water and other substances. In soil it decays and produces humus, which also has some of the power of charcoal to absorb gases and soluble substances. Fine particles of charcoal in the ashes of the garden bonfire therefore make the ash of special value when applied to the soil because of that ability to absorb soluble plant foods which might otherwise be leached out of the soil and to hold them until they are absorbed by plants.

A good type of slow-burning or "smother" fire is shown in the illustration on this page. Its arrangement is such that good burning material forms a central heap around the bottom of a central iron bar or stake of green wood pressed a few inches into the ground. It should not be pressed in too far or it may be difficult to move without breaking down part of the heap if its removal should become necessary later. The heap should be layered as shown. Dry twigs or small prunings are heaped over the easily-lit central core which can consist of tinder-dry straw, leaves, oily, kerosened paper, rags, etc. Branches and larger prunings can then be heaped on top of the twigs and smaller prunings, and finally a layer of diseased or infected plant material and perennial weed roots can be placed over the branches or larger prunings. The whole should then be covered with a coating of soil about 3 or 4in. thick and beaten firm with the back of a spade. If the bonfire is built as shown, it should burn for about a week and the ash should then be collected. The gap for ventilation should be made at the side facing the prevailing breeze, though it is better made on the sheltered side if the wind is strong or gusty, as otherwise burning may be uneven. The rate of burning is largely determined by the size of the air vent. Ventilation can be increased on calm days by slightly raising the central shaft. The shaft can be removed altogether and tested for heat if it is suspected that the fire has gone out.

Ash of young wood, twigs, etc., and of material such as bracken is richest in potash. The different kinds of mature wood are extremely variable in the potash content of their ashes. Some are nearly ten times richer than others. Most weeds are quite low in potash content. Whatever its source, the ash from the garden fire must not be exposed to rain or its most valuable constituent will be lost quickly.

Ashes are beneficial as fertilisers on all soils, but require care in application, especially to heavy soils. Very heavy dressings are liable to "cake" the surface of the soil and impair the tilth and therefore they should be avoided on heavy soils unless deeply and thoroughly incorporated.

Outstanding Achievement in Swine Husbandry

THE breeding of a litter of baconer pigs aggregating 4050lb. liveweight when killed was the outstanding achievement in swine husbandry of Messrs. H. W. Montgomerie and H. G. Bell, of Papakura, recently. From birth to killing 6 months later the pigs made an average gain in weight of 1.43lb. or 10lb. per week.

AT farrowing the litter comprised 16 pigs, but one died. It was weighed at intervals and careful records were kept of the feeding of both sow and offspring. At 3 weeks the total weight of the litter was 252.63lb., an average of 16.8lb. When weaned at 8 weeks the litter weighed 964lb., the average being 64.2lb., a record for this age. The heaviest pig was 80lb. and the lightest 52lb. The lightest at this stage was still the smallest when killed.

Steady Average Gain

At 12 weeks the aggregate weight was 1480lb., a gain in 4 weeks of 516lb. The average weight then was 98.6lb., the heaviest pig being 112lb. The total weight at 16 weeks had risen to 2101lb., with an average of 140.1lb., and at 20 weeks the total was 2927lb., the average being 195.1lb.

[*Neuline Film Studios Ltd. photo.*
"Beldene Princess," dam of the litter.

In the next 4 weeks there was a gain of 840lb., making the aggregate 3767lb. and the average 251.1lb. There was a further gain in the last 2 weeks of 283lb., bringing the total liveweight at killing to 4050lb., an average of 270lb.

The heaviest pig was 336lb. and the lightest 233lb. In the last 2 weeks three of the pigs lost weight, though the average gain was 18.8lb. The maximum gain of any pig was 3¾lb. per day or 26lb. per week in the last fortnight. The total dressed meat produced was 3293lb. warm weight or about 220lb. per pig.

In the first week after farrowing the sow was fed on well-watered skim-milk with just enough garbage to give it some flavour. In the second week she was fed 4 gallons of garbage, 4 gallons of skim-milk, a dessertspoon of fish oil, and 1lb. of bone flour. From then until the litter was weaned she received 16 gallons of garbage, 4 gallons of skim-milk, a dessertspoon of fish oil, 1lb. of bone flour (rising to 2½lb.), and 1lb. of meatmeal.

Garbage the Main Food

Garbage was also the main food for the litter, and was obtained from the training college at Ardmore. It was supplemented with skim-milk, bone flour, meatmeal, and, at a later stage, crushed barley and peas, biscuits, and maize cobs. In the second week the pigs received 1 gallon of garbage, 2 gallons of skim-milk, 5 teaspoons of fish oil, and ½lb. of bone flour. This was increased in the eighth week to 20 gallons of garbage, 10 gallons of skim-milk, 15 teaspoons of fish oil, 2½lb. of bone flour, and 2lb. of meatmeal.

[*B. Snowden photo.*
The litter of 15 pigs on the hooks.

The ration at 12 weeks was 20 gallons of garbage, 16 gallons of skim-milk, 15 dessertspoons of fish oil, 3lb. of bone flour, and 4lb. of meatmeal, and by the twentieth week the litter was receiving 20 gallons of garbage, 50 gallons of skim-milk, 20 dessertspoons of fish oil, 5lb. of bone flour, and 7lb. of meatmeal.

With the closing down of the training college for holidays the supply of garbage fell away, and in the twenty-second week it was reduced from 20 to 10 gallons. The skim-milk was increased to 60 gallons, and 7½lb. of crushed barley and peas, 10lb. of biscuits, and 3 maize cobs were added to the feed.

The quantity of garbage fell away to 5 gallons in the twenty-third week and the skim-milk was increased to 65 gallons, the remaining part of the ration being 20 dessertspoons of fish oil, 5lb. of bone flour, 7lb. of meatmeal, and the same quantities of crushed barley and peas, biscuits, and maize cobs. In the last 2 weeks there was no garbage available and the amount of skim-milk was increased to 70 gallons, the quantities of the other feed remaining the same.

The dam of the litter farrowed again on January 15. The number in this litter was 12.

—*A. LONGWILL, Superintendent of the Pig Industry, Department of Agriculture, Wellington.*

[*Neuline Film Studios Ltd. photo.*
Two of the pigs before they were sent to the works.

Rapid Spread of Water Hyacinth in Rangitaiki Canals

By E. R. MARRYATT, Fields Instructor,
Department of Agriculture, Whakatane.

ALTHOUGH water hyacinth may be considered a plant of extreme beauty, its evil reputation overseas is evident in other names for it such as "Florida devil" and "the world's worst weed," and in America it is called "the million-dollar weed." The names indicate the concern it causes and the cost of controlling it, and should indicate the wisdom of preventing it from becoming permanently established in New Zealand. Recently the weed has established itself in the Whakatane district, where it is already proving a serious menace.

H. H. ALLAN (1) describes the plant as follows: "*Eichhornia crassipes* Schlecht. Water hyacinth. Leaves nearly orbicular, with inflated petioles; scape with conspicuous sheath near middle; spikes many-flowered; flowers 6-lobed, violet, the large upper lobe with yellow patch."

Water hyacinth belongs to a small family of aquatic plants not in any way related to the true water lily, but often mistaken for one. It is a perennial which originally came from Guiana in tropical South America and so is more likely to be a pest in tropical or sub-tropical than in temperate climates. In warm weather it increases vegetatively and with great rapidity by means of stolons (see the illustration on page 334) in much the same way as strawberries spread by runners. Unlike those of the strawberry, however, the stolons of water hyacinth are very brittle, particularly as they grow old, and the young plants easily become separated from parent plants by movements of the water or air. Some overseas reports state that there is profuse production of seed, which falls on the surface of the water and soon germinates, but others assert that only a few seeds are produced. Whether viable seed is produced in New Zealand is not yet known.

Below the attractive, shiny leaf is an enlarged, bulbous portion of the leaf stalk, honeycombed with air cells which make it an excellent float. The bulbous portion becomes elongated as the leaf grows larger. The flower is described as "a delicately-handsome, pale heliotrope or mauve" and "with the top petal of each bloom marked with a prominent yellow stripe." In "Water Hyacinth in South Australia" W. J. Spafford (2) describes the leaves and stalks as follows:—

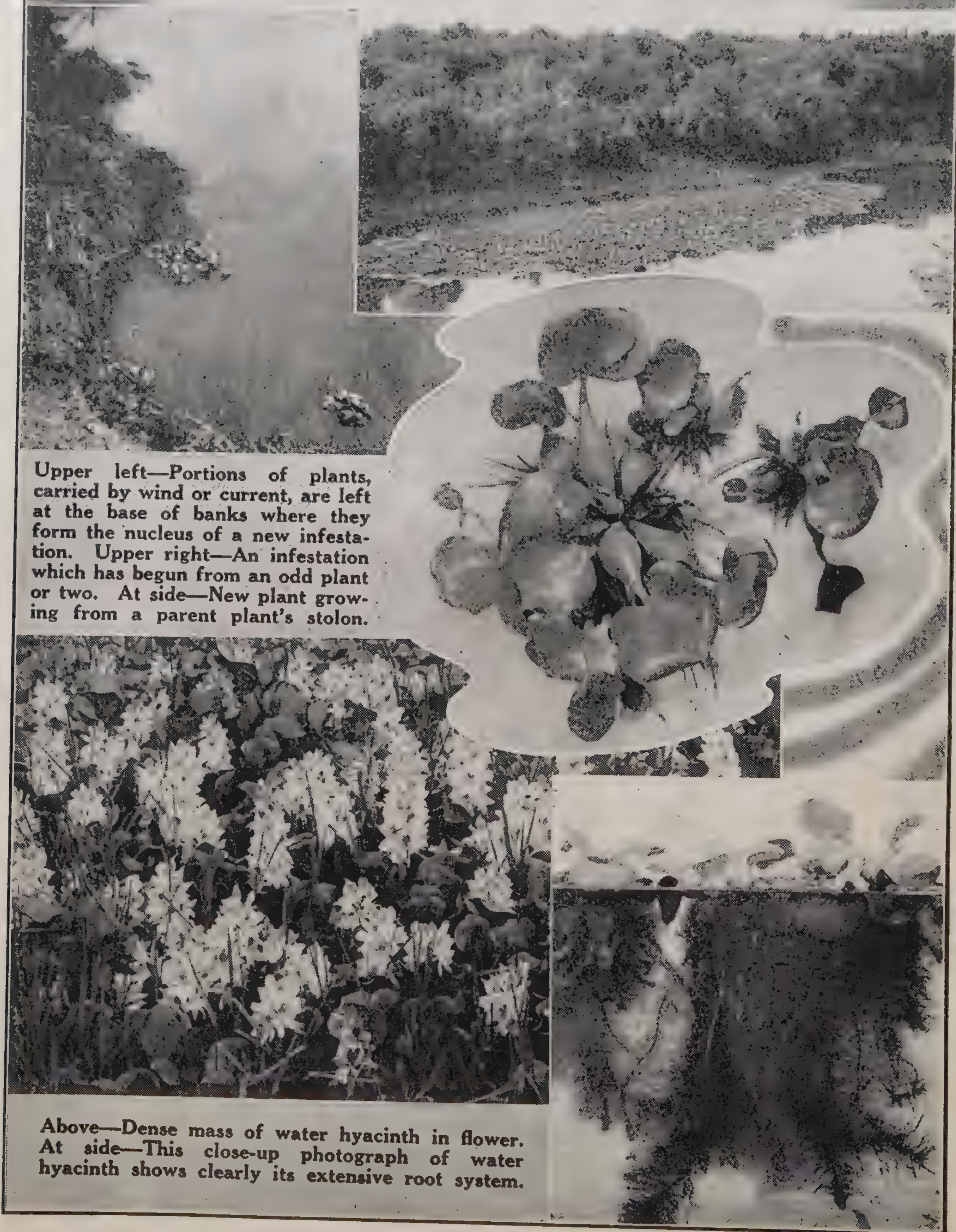
"There is considerable variation in the appearance of the leaves and the leaf stalks of water hyacinth, and also in the height to which the plants grow. In some patches in a lagoon or river there may be quite extensive areas where the plants are between 3ft. to 4ft. in height, whilst in other patches they are no taller than 6in. to 10in. Although the leaves vary a good deal in shape, in general outline they are rounded and have a marked tendency for the outer edges to fold towards one another. The stalks of young leaves consist of bladder-like swellings filled with air which act as floats to keep the

WARNING!

On no account should unwanted plants of water hyacinth be thrown into streams, drains, or lakes; they should be left on dry land where they can do no harm and will soon die. No matter how beautiful the hyacinth may be the public must see that this weed is not allowed to spread. If it is noticed becoming established in a new place the nearest office of the Department of Agriculture should be advised immediately.

HEADING PHOTOGRAPH: Water hyacinth in flower. *Naden Matthews photo.*

WATER HYACINTH AND ITS NATURE OF GROWTH

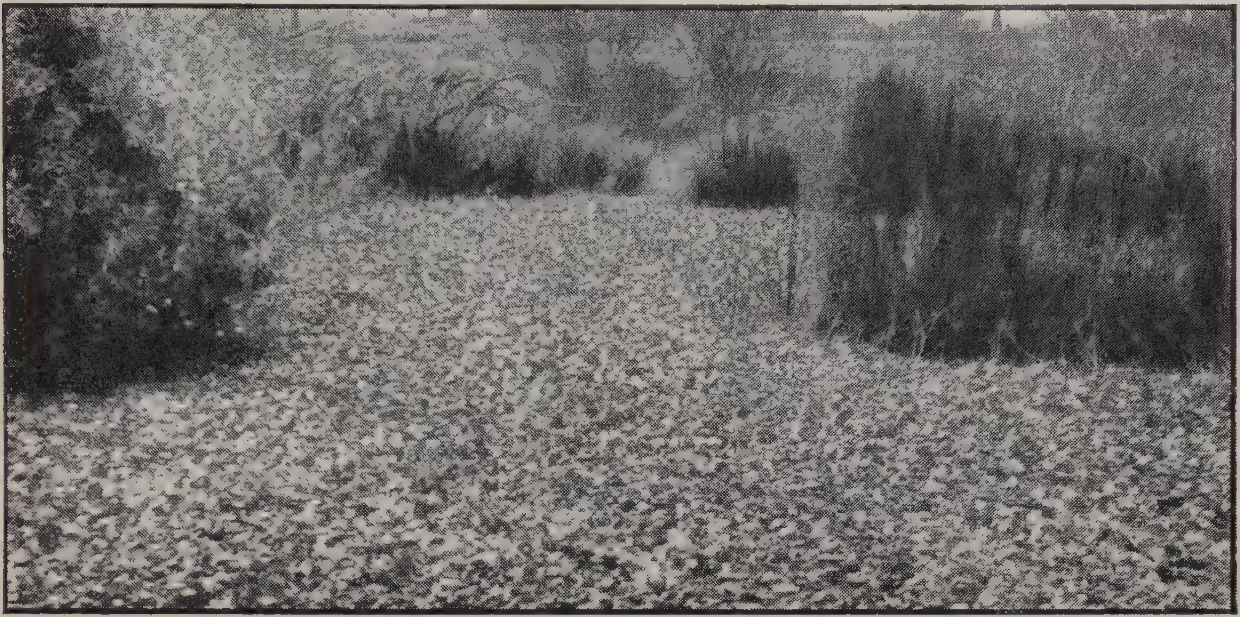


Upper left—Portions of plants, carried by wind or current, are left at the base of banks where they form the nucleus of a new infestation. Upper right—An infestation which has begun from an odd plant or two. At side—New plant growing from a parent plant's stolon.

Above—Dense mass of water hyacinth in flower. At side—This close-up photograph of water hyacinth shows clearly its extensive root system.

[*Photographs at centre and lower left by Naden Matthews.*

RAPID SPREAD OF WATER HYACINTH IN RANGITAIKI CANALS



Part of the old bed of the Orini River completely covered by water hyacinth in October when the weather is still very cold.

plant in an upright position on the surface of the water, and to prevent them from falling over whilst being carried along with the stream or when being blown about by wind. As the leaves become older the leaf stalks extend and the globular swellings gradually disappear, and when fully grown the leaf stalks taper from about 1in. in diameter at the base to about ½in. near where the leaf is attached, but they remain more or less hollow and still contain a lot of air, thus keeping the plants buoyant throughout their lives."

The root system of water hyacinth is extensive. When plants are thrown on dry land and die the leaves and stalks, which are composed principally of soft tissue, water, and air, soon wither away and before long it is mainly the dead, matted, fibrous roots which remain.

Habitat

Water hyacinth will live only in permanent water or on very wet land that does not dry out. It does best in ponds and backwaters or in sluggish streams (see the illustration on this page) and as it is not securely anchored, but usually floats freely, it will not survive in fast currents. It cannot tolerate dry conditions or salt water and is susceptible to cold.

Distribution

In parts of tropical America, in India, South Africa, Fiji, and in some areas of Australia water hyacinth is a serious pest. It has been present in New Zealand for many years. A warning against buying and selling water hyacinth for use as an ornamental flower in lakes and rivers was given in the June, 1926, issue of "The New Zealand Journal of Agriculture" (page 412). The article states that the plant had been established for many years on a small scale in many parts of the North Island " . . . and while in some cases but little trouble had arisen, in others great regret is expressed that it was ever planted."

Cheeseman in 1899 recorded its presence at Te Aroha and it is also recorded as having been grown in the Waikato and at Waipukurau, New Plymouth, and Tauranga. Quite recently it has appeared in some of the Rangitaiki Plains drainage canals near Whakatane.

Establishment at Whakatane

How water hyacinth came into some of the canals of Whakatane County is not known and is relatively unimportant, except as a warning which should be heeded. It is quite likely that someone threw a plant into the water with the idea of making that part of the canal more attractive scenically to the passer-by, because it was introduced in that way in other places and because water hyacinth was first noticed in 1946 near a bridge over the Orini Canal on the well-used golf links (Eastern Boundary) road. Despite considerable efforts to eradicate it, the plant has now spread over several miles of the Orini Canal—in the old bed of the Orini River—and the Kopeopeo Canal, and has worked its way into some of the lateral drains and backwaters. This spread is very alarming to local farmers and to officers of the Lands and Survey Department, who are responsible for the maintenance of canals and drains, particularly because strenuous and expensive efforts at eradication so far have been unsuccessful.

In 1926 a farmer at Waipukurau claimed that water hyacinth was readily eaten by his cattle, but on the Orini River, where cattle have free and easy access to the plant and in fact wade in among it for water, they have not shown the slightest interest in it. (The only exception to this is after the plants have been sprayed with a 2, 4D preparation during summer, when, within a few days of spraying, treated plants in their yellowing, twisting, curling condition caused by the spray are greatly relished by dairy cows.)

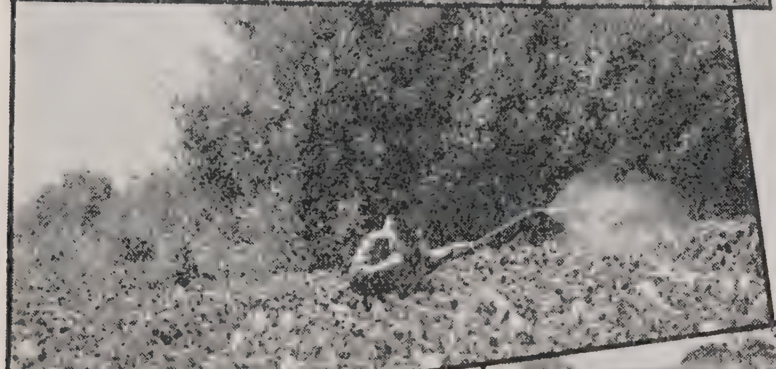
Florida Devil

The name Florida devil is fully justified, for under favourable conditions water hyacinth spreads so rapidly that it can quickly make waterways impassable to all classes of shipping. Dense masses of the weed can block irrigation and drainage channels and can cut off air and sunlight, thus encouraging the multiplication of semi-anaerobic bacteria (those which thrive in the absence of the usual supplies of oxygen), which decompose the underwater vegetation, generating carbonaceous gases harmful to fish, and indeed, according to some Indian publications, to human habitation in the vicinity.

The following account of the rapid spread of water hyacinth on the River Murray in Australia (2) shows just what a danger the plant constitutes:—

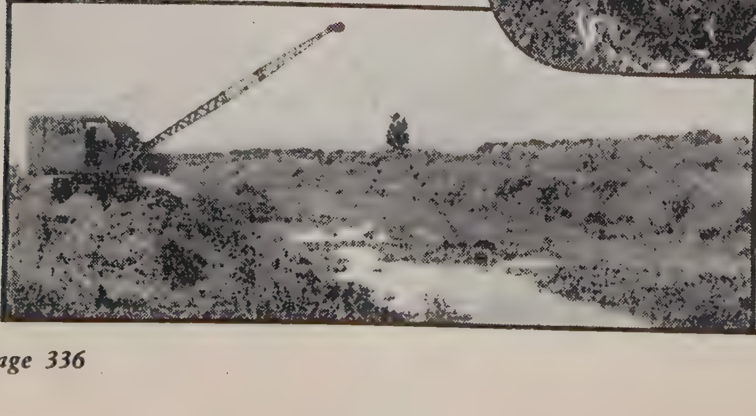
> In the spring of 1937 a resident of a fruit-growing settlement on the River Murray, being struck by the extreme beauty of water hyacinth which had multiplied rapidly in a fish pond at his home, and having no knowledge of the enormous amount of damage which had been, and can be, caused by this plant, conceived the idea that patches of it growing in some of the rather untidy lagoons behind the banks of the River Murray would add to the attractiveness of the scenery and perhaps lead to an increased tourist traffic to the River District. With this idea in mind, a few plants were thrown into the Ramco Lagoon about October, 1937, with a result

CONTROL OF WATER HYACINTH



Above—Hyacinth will not survive in saline water and the impounding of salt water by closing flood-gates in the lower reaches of drainage systems assists control. However, control is achieved only as far as the saline water reaches in canals.

Upper left—Cows had continuous access to this area of water hyacinth in the Orini River, but until soon after it was sprayed with hormone weedkiller they had not been known to graze it. They grazed the sprayed weed cleanly almost to the water, but did not eat any not treated. Cows did not appear to suffer any ill effects from eating the treated hyacinth. Above—Spraying water hyacinth with hormone weedkiller. The photograph shows that hyacinth can grow vigorously in water of considerable depth.



Bottom left—A drag-line dredge operated by the Lands and Survey Department removing masses of water hyacinth from the Orini Canal and depositing it on the bank. Above—Dying plants, which were removed by the drag line.

[Photograph at lower right by Naden Matthews.

RAPID SPREAD OF WATER HYACINTH IN RANGITAIKI CANALS

Water hyacinth spreads rapidly, so much so that unless it is destroyed the clear water shown here is likely to be covered completely in a short time.

startling in its unexpectedness. During the summer of 1937-38 the plants placed in the lagoon threw out stolons (creeping stems) radiating in all directions from the parent plants from which new plants developed, and patches of some feet in diameter were produced, but in the summer of 1938-39 the increase in plants which took place is almost beyond imagination. Now, in the autumn of 1939, there are acres and acres of Ramco Lagoon covered with a dense mass of water hyacinth, the mass being sufficiently dense in many parts to support the weight of a man standing upon planks thrown on to the growth; the pest has taken a good hold in other lagoons, and has anchored and multiplied into patches from a few square feet to a few square yards in extent in many spots in the River Murray itself, in protected coves and inlets along its banks. The enormous and dreadful development of this evil weed in the River Murray has all taken place within a period of 18 months from the original introduction of the plants, and had it confined its activities to the near neighbourhood of its starting point, although potentially dangerous, it would not have been nearly so serious as it is proving, for within the past few weeks clumps and single plants have been breaking away from the larger patches, have floated out into the stream, been carried over the locks, and have been deposited in numerous spots along the banks between the source near Ramco right down to the swamps near Murray Bridge.

How Water Hyacinth Spreads

When water in which water hyacinth is growing is disturbed either by wind, tide, current, flood, or by the movement of man, stock, or boats the brittle stolons break and the young plants or clumps of plants are floated, blown, or carried up or down stream or to the opposite bank, eventually lodging against some obstruction and starting a new patch of hyacinth. On any windy day this weed movement can be seen in the Orini Canal. As reproduction by seed is known to occur in other countries, it may also occur here, and during the summer and autumn it is possible that seed is blown about on the surface of the water and carried by man, water birds, and livestock.

Control and Eradication

The plant is susceptible to cold, but the manner in which it has spread during the last 2 years in the Rangitaiki canals, where moderate frosts are not uncommon in the winter and sometimes right through to the summer, shows that it is capable of enduring cold conditions and some frosts, provided the climate is generally mild. Though the aerial parts of the plant may be damaged or killed by frost, the underwater portion remains uninjured and can send up fresh growth.

Lands and Survey Department officers, knowing that water hyacinth cannot tolerate salt water, opened the lowest floodgate in the Orini Canal and allowed the tides to bring in saline water. This killed a great deal of the weed, but the method has obvious limitations. It is effective only as far as the brackish tidal water reaches, and it can be carried out only to the extent that it does not interfere with farming operations such as the proper watering of stock. Advantage has also been taken of the fact that water hyacinth cannot tolerate dry conditions and the Lands and Survey Department has employed men to drag the plant out of the canals and throw it on to the banks where it soon dies. However, there are always a few plants which escape this treatment and though a great difference is made for the time being, with the arrival of warm weather the weed again makes astonishingly-rapid growth.

Overseas reports state that the plant is susceptible to the weedkilling hormones and experiments are in progress with these chemicals to determine an effective method of eradication. It seems likely that one of these hormone weedkillers used as a spray during the late spring and early summer will prove effective, but it is too early yet to have reached a conclusion as to the most economic dilution.

The Lands and Survey Department views the weed so seriously that it is not waiting for the final results of experiments, but on recent evidence of an apparent 95 per cent. kill from hormone weedkillers is attacking the infestation immediately with a view to eradicating the plant from Rangitaiki waterways.

As far as is known water hyacinth is not infesting other canals, rivers, lakes, or streams in New Zealand, and every precaution must be taken to see that it does not become a nuisance. In the Whakatane district where the free flow of water in the drainage canals and clear flood-gates are essential if farming is to continue, the plant must be eradicated.

A Dangerous Plant

In the drainage canals of the Rangitaiki Plains it is a menace. Anywhere frosts are not too severe it can spread in canals, rivers, drains, streams, and lakes. It is present in different parts of the North Island in "safe" enclosed dead water such as artificial lakes, ponds, and aquariums, but it could easily appear and quickly spread in localities with a mild climate even if there are occasional moderate frosts. Where it can do harm it must be recognised and destroyed before it becomes firmly established.

References

1. H. H. Allan, "A Handbook of the Naturalized Flora of New Zealand."

2. W. J. Spafford, "Water Hyacinth in South Australia," Department of Agriculture of South Australia Bulletin No. 345.

WINTER PASTURE MANAGEMENT ON DAIRY FARMS

SEASONAL NOTES Contributed by the EXTENSION DIVISION

THE main features of efficient winter pasture management on dairy farms have been described in two articles which have appeared in this "Journal." The first, "Winter Pasture Management—Attaining High Production per Acre," appeared in the February, 1939, issue and the second, "Autumn-saved Pasture on Dairy Farms," in the February, 1949, issue.

THE chief points enumerated in these articles are:—

The avoidance of close and continuous grazing;

The provision of late-winter and early-spring feed from saved grass;

The efficient utilisation of this saved feed, and

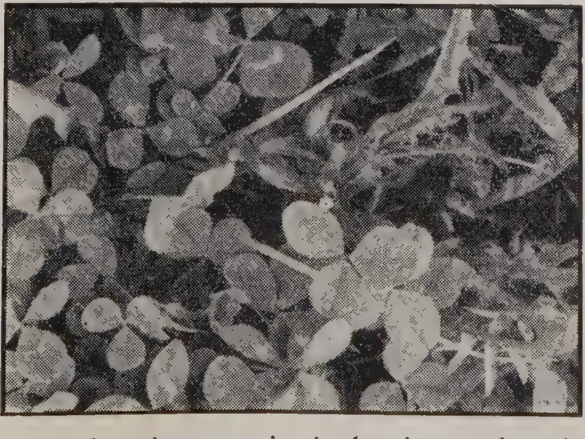
The importance of supplying supplementary feed in the autumn before the cessation of grass growth makes such feeding out necessary.

This last point is the really essential feature of efficient pasture management.

The time to start feeding out varies in different districts and seasons. In the colder southern or elevated northern regions it may be necessary to start in March, while in the warmer districts May may be soon enough; but it is impossible to save feed or avoid close and continuous winter grazing unless this supplementary feeding starts while there is plenty of grass.

Supplementary feeding should start in the autumn before the cessation of grass growth makes such feeding out necessary.

One reason why more farmers do not practise early supplementary feeding and its complementary practice of saving grass for the late winter and early spring is that they feel that they may want the hay or silage in the late winter or spring if growing conditions are poor. Actually the need for supplementary feed is less where efficient management methods are used than it is when feeding is delayed until all pastures are closely grazed, because the use early and freely of adequate supplies of hay and silage, plus the rationing off of saved autumn grass, plus lenient grazing in the winter will give earlier growth in the spring. Earlier growth in the spring enables earlier ensiling and haying of the surplus growth, which results in earlier and better aftermaths and greater ease in saving autumn grass.



Close and continuous grazing in the winter weakens the grasses' ability to produce in the spring and results in pastures in which white clover is dominant. It also encourages flat weeds such as ribgrass, catsear, and hawkweed.

Close and continuous grazing in the winter weakens the grasses' ability to produce in the spring. It gives less grazing than it appears to give. It strengthens the clover's ability to produce in the spring, often resulting in trouble from feed flavour in cream and losses of livestock from bloat. It also reduces the possible total pasture production for the year.

On the other hand, lenient grazing in the winter allows the grasses to build up a large root system; it provides grazing for early-calving cows; it provides mature and "safe" pasturage in the spring, and it changes clovery pastures into more grassy ones. It also ensures the maximum pasture production for the year.

Grazing management determines very largely the ratio of grasses to clovers in a pasture. The two most important features are topdressing and grazing, and of the two grazing is by far the more powerful artifice for controlling the grass : clover ratio. Indeed, the dairy farmer is the master of the ratio of grass to clover in his pastures if he but understands the principles of pasture management and has the skill to apply them on his own fields. His grazing management during the winter and early spring will certainly determine the ratio of grass to clover in his pastures when active growth begins in the late spring.

The Principles of Poultry Breeding

OF the many operations in poultry husbandry, breeding is at once the most interesting to the true lover of stock and the most difficult to carry out successfully. Though there are certain rules or principles to guide the breeder, results are particularly difficult to predict and, indeed, even to assess when they have eventuated.

APART from the fancier, who often breeds poultry as a hobby and does not depend on the results for a livelihood, most poultry breeders desire to achieve progress with their birds for commercial ends, whether expressed in terms of increased egg production or of better quantity and quality of poultry meat. Whatever the objective, the fundamental principles of breeding are similar, but for success much depends on the breeder's ability to recognise in birds the qualities which are sought. Some people even contend that successful breeders of stock are born and not made; at least, certain breeders appear to have a particular flair for handling birds in the breeding pen.

The breeding of poultry is not a simple operation, but with understanding may come patience and less likelihood of despair when breeding programmes fail to give the results anticipated.

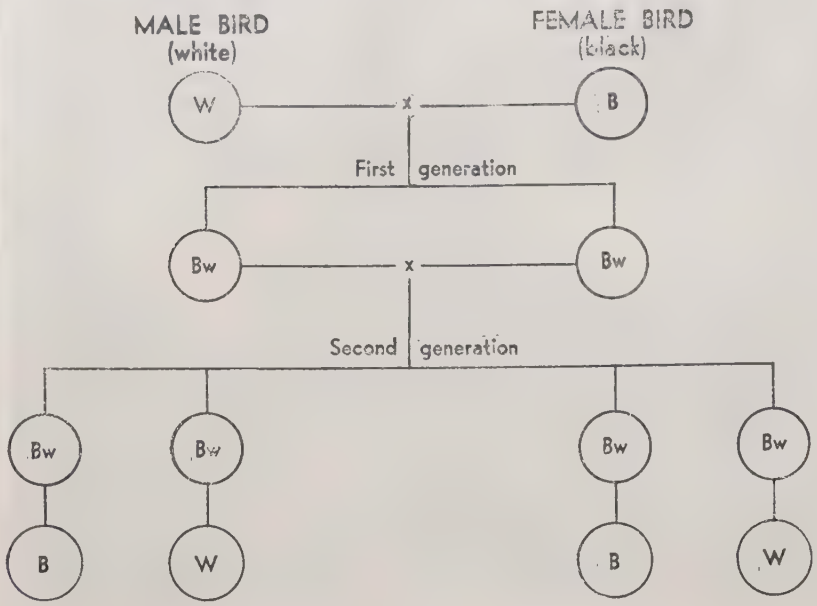
Variations in Characteristics

Two aspects of breeding require early consideration.

First, it is essential to appreciate that there is great variation among poultry, without which progress in breeding would not be possible. Selection depends on variation, and without selection improvement is impossible. The fancier, essentially concerned with breed characteristics, sees innumerable variations in such factors as feather colour, shape of comb, size of ear lobe, and body type. By observation, selection, and intelligent mating of male and female, the fancier attempts to breed the perfect specimen for the breed he favours. These characteristics do not always breed true or appear in the progeny as intended by the breeder, yet they can all be seen by the breeder and assessed for their strength or weakness. How much more difficult, then, is the task of the poultry producer breeding for increased egg production where there are genetical factors which cannot be seen but are essentially connected with egg production locked up in the bird's make-up. Some are associated to a limited extent with exterior characteristics and can be assessed by the observant breeder.

The problem is further complicated by the degree to which a male or female can transmit desirable characters. A hen with a high first-year egg production may produce daughters with much inferior annual egg production. Another point of importance is that the greater the number of factors or characteristics being bred for, the more difficult does the attainment of complete success become. To breed for one character, such as eye colour, may be comparatively easy if others are ignored, but to breed for egg production and good colour in a multicoloured bird presents a far greater problem. Thus, one of the practical difficulties of poultry breeding is that the breeder is often selecting stock for several different characteristics simultaneously. Accordingly, the commercial breeder is forced to give first consideration to the factors which are more important economically, sometimes at the expense of breed characteristics.

THE principles of poultry breeding form a subject which must have a wide appeal to all classes of poultry keepers, both fanciers and commercial producers. It is a wide subject and one not easy to condense into a limited series of articles. This is the first of a series by F. C. Bobby, Superintendent of the Poultry Industry, Department of Agriculture, Wellington, in which the breeding of poultry will be discussed mainly in simple, practical terms. Of necessity, however, reference must be made to the principles of breeding, thereby including a proportion of theory and some genetical terms.



Note: In this diagram the symbols used are not those normally used by the geneticist, but have been adopted specially here for the purposes of simplicity.

Assessing Results

The second aspect of breeding requiring early consideration is the assessment of the results of any mating or breeding programme. For example, it has been stated that egg production is affected by breeding to the extent of 40 per cent., the remaining influence being that of environment—that is, management. Therefore, results of a breeding programme can be clouded by poor management from the incubation period until the end of the first pullet year. The influence of season must also be contended with—a factor beyond the control of the breeder. Thus, before breeding results can be assessed accurately, the breeder must be satisfied that management has been good at all stages and the season normal.

For the commercial poultry breeder, results of breeding practice must be measured over a period, during which each economically-important factor is noted. A start will be made with incubation results; rearability of chicks during the brooder stage will follow, and some 18 months must elapse before egg-production figures can be assessed. Obviously, unless careful records are kept for each stage, facts of importance can easily be overlooked or forgotten.

It is apparent that poultry breeding is a skilled operation, but its problems and infinite possibilities make it perhaps the most fascinating operation of poultry farming. Despite the difficulties named, progress can be and is being made by breeders with a knowledge of and love for their stock.

Inheritance

The broad principles of inheritance must be understood if a poultry breeder is to take an intelligent interest in breeding practice.

Poultry have numerous characters, a White Leghorn, for example, having white plumage, a single comb, yellow legs, and white lobes. In addition, there is great variation among birds of a similar breed—single combs vary in size, in shape, and in the number of spikes carried; ear lobes vary in size and shape. Without these variations—quite apart from widely-differing, well-defined characters—selection for a desired objective or perfection would be impossible. Progress could not be made.

Well-defined characters are inherited. The principles of breeding are employed to retain desirable characters and to eliminate undesirable ones; selection is employed to make use of the innumerable variations for the purpose of making progress. Every character shown by a bird is represented by a factor known as a "gene" in the reproductory cell of that bird, male or female. A fertile egg carries a "germ" which contains all the factors or characters of both the male and female parents. However, the male parent may be white in plumage and the female black, and both colour characters have been placed in the germ of an egg from such a mating. Here the mechanism of inheritance may be studied and an example quoted which has been used extensively to illustrate the laws of inheritance.

If a White Rose-comb Bantam male is mated to a Black Rose-comb Bantam female, the cockerels and pullets from this mating are all black in plumage, the character white, existent in the male parent, apparently disappearing. However, if the black cockerels and black pullets of this first generation are inter-mated, their progeny will include both black birds and white birds; the character for white had not gone but had disappeared only temporarily. Further, if this second mating (black male x black female) produces a number of progeny, for every white bird there will be 3 black ones.

This example illustrates one of the fundamental laws of breeding. In the first mating the black plumage completely eclipsed the white plumage. For this reason black plumage in this instance is termed a "dominant character," and black plumage is said to be dominant to white. Conversely, white, because it disappears, is said to be a "recessive character."

The diagram on this page will assist in illustrating what has taken place. B indicates black plumage and W white plumage. In the first generation both the black male progeny and the black female progeny are shown as Bw; the B indicates that black is dominant and the w that white is present as a recessive character and is not visible. In the second generation 4 males and 4 females appear in the diagram; 2 of each are shown as Bw (the same as the first generation), one as B (the same as the original black female bird), and one as W (the same as the original white male bird). Thus it becomes apparent that the 3 black birds of the second generation—male or female—though they are alike in appearance, differ in breeding or genetical make-up: Two are black with the white present as a recessive, and the third is pure black genetically—that is, no white is present as a recessive character. The 1 white bird is pure genetically.

It is essential that the genetical difference between the 2 types of black progeny described be appreciated. Special terms are applied to each:—

Bw—Black birds containing white as a recessive; these are "impure" blacks and are termed heterozygous for black.

B—Black birds containing no white as a recessive; these are "pure" blacks and are termed homozygous for black.

The mating described illustrates the first basic principle of inheritance, which was discovered by Mendel. He carried out his breeding experiments with peas, but the principle established, known as Mendel's law, applies to poultry as well as to plants. The important point is that birds homozygous or "pure" for either white or black plumage, if mated pure (that is, white x white and black x black), will always give pure progeny. On the other hand, birds which are heterozygous or "impure" for black, if mated together, will give both black and white progeny in the proportions of 3 black to 1 white, as shown in the second generation of the diagram. Unless this basic principle is understood thoroughly it will be difficult to appreciate other practical illustrations which will be given in later articles.

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GROWING STRAWBERRIES IN THE HOME GARDEN

THOUGH the strawberry is still the most favoured of the small fruits for dessert purposes in New Zealand, production has declined rapidly over the past 10 years, mainly owing to the incidence of virus diseases, until at present the demand is not nearly supplied. By carrying out the treatment recommended in this article by J. H. Watt, Orchard Instructor, Department of Agriculture, Wellington, the home gardener should be able to produce from a small portion of his garden a supply of fresh berries which, at least, will augment the quantity available from commercial growers.

[*Sparrow Industrial Pictures Ltd. photo.*

A mulch of straw being put round strawberry plants.

STRAWBERRIES are low, perennial herbaceous plants which occur naturally in most parts of the world, but mainly in the temperate regions of the Northern Hemisphere. Native species are common from the plains to the dry hillsides of the cooler regions, but in the warmer zones they occur only at higher altitudes where it is cooler. They prefer deep, loose, warm soils on the edges of woods and are rarely found in the open.

The commercial strawberry of today has been developed by hybridisation of natural species, while fruit size and quality have been increased to present-day standards by a process of selection.

Commercial strawberry growing is fairly specialised, but the home gardener can produce good fruit if he is prepared to give the bed detailed attention. The strawberry, more than any other small fruit, reflects in yield the treatment given.

Though establishment and production costs are fairly high, usually yields are more than proportionately high compared with other small fruits and taking into account the cost of buying the fruit. With strawberries there is a quicker return on outlay than with bush fruits, as a full crop is produced within a year of establishment.

Location

Strawberries can be grown in almost any district in New Zealand where spring frosts are not severe at the blossoming period, and even where heavy spring frosts may occur it is possible to produce good crops in favourably-situated gardens.

The selection of a suitable site in a garden is governed by soil type, moisture supply, drainage, and protection from strong, cold winds. A sunny situation with a northerly aspect is preferable and any slope will facilitate run-off and drainage.

Soil Type

A well-drained soil with good water-holding capacity is necessary, preferably a medium to heavy, deep loam. However, strawberries will do well in soils ranging from sandy loams to fairly-heavy, friable clays, provided that adequate measures are adopted in the initial preparation of the plot to ensure good growing conditions. Then, too, varieties differ in their soil requirements.

Light soils which are not sufficiently retentive of moisture should be built up with green crops or other organic material before planting, and similar treatment may be applied to improve soils which tend to be too heavy.

It is impossible to say definitely what depth of well-drained soil is required to grow vigorous plants and heavy crops, because a soil which allows only shallow root run may be adequate where there is an even distribution of rainfall or where it is possible to irrigate the crop throughout the season. It is suggested, however, that 15in. should be regarded as the minimum soil depth.

Drainage

Drainage cannot be judged adequately by reference to the surface only, or even to the depth of normal cultivation—a few inches below the surface. Soils should be tested by digging holes to ascertain at what height the water-table remains for a damaging period. That is shown by the variations in colour in the soil: Marked local changes in colour from greys or yellows to chocolate or red-chocolate show poor drainage. The "mottling," as the changes in colour are called, occurs up to the level to which water remains long enough to be damaging to the roots of strawberries.

Where "mottling" occurs drainage should be improved to prevent any stagnation of water which will cause roots to rot. In addition, in areas where periods of heavy rain occur, open drains round the bed will facilitate run-off and prevent waterlogging.

All drainage improvements should be planned ahead and carried out in conjunction with the deep digging necessary before planting. In general, ground which is suitable for vegetable growing and which has been used for this purpose for several years will be found suitable for strawberries.

Moisture Supply

Strawberries, perhaps more than any other crop, respond to periodic applications of water during the growing season. Adequate moisture, by prolonging the growing season, increases yield in fruit size and in total weight. Where rainfall is normally insufficient or where there is possibility of drought, provision should be made for irrigation. Overhead watering is usually superior to any system of flood irrigation, as distribution is controlled and waterlogging avoided.

Susceptibility to Frost Damage

Because its low habit of growth keeps the flowers near the ground, where the coldest air accumulates, the strawberry is very susceptible to frost damage at flowering time.

Frost damage can be easily recognised by the blackening of the central parts of the flowers. Flowers damaged by frost will not set fruit.

Where spring frosts occur it is advisable to plant strawberries on a slope, which will allow the cold air to drain away to the lower levels. Strawberries should not, however, be planted on slopes just above trees or taller plants, as these will act as a barrier to air drainage and the cold air will bank up, increasing the risk of frost damage.

Because of their low habit of growth strawberries do not require much protection, but in exposed positions where excessive or cold winds are experienced shelter should be provided. A hedge of manuka brush will afford cheap, adequate shelter.

Preparation of Soil

Success or failure with a strawberry bed can depend on soil fertility, which, in turn, is bound up with the treatment given before planting. Cultivation must be thorough, to get the best planting conditions, and deep, to improve drainage and aeration, which will promote sufficient root development to enable plants to cope more successfully with dry conditions. Excess or stagnant water is fatal to strawberries—roots are destroyed, and plants cannot carry a crop when affected by "root rot." Bad conditions can be improved by deep or double digging with the "lie of the land" to give better drainage, and any clay pan which impedes the escape of water should be broken down when digging is done.

Areas which have not been cultivated for several years should not be planted in strawberries immediately the land is broken up. It is preferable to use a part of the garden which has been cultivated for vegetable growing for at least a year or two, because this will be in better condition and weeds will not be so troublesome.

Importance of Humus

The amount of humus in the soil at the time of planting has a direct bearing on the amount of plant food which will be made available during the growing season. Even some artificial manures must be broken down by bacterial action before the plant can use them, and to live in the soil bacteria need humus. Humus is directly responsible for holding water in the soil in a way that the plant can use it. Heavy clay soils may hold too much water by colloidal attraction and may be too wet for strawberries; light sandy soils may not contain enough colloidal matter to hold sufficient water and may dry out too quickly. In either case the application of humus will improve the water-holding capacity. In light soils the colloidal properties of rotted humus increase the ability of the soil to hold water, while in heavier clay soils the humus will make the ground more porous and allow excess water to drain away.

Humus may be supplied as partially-rotted vegetable material such as stable manure, vegetable refuse, or compost. In gardens where green crops have been grown and dug in the soil will probably be in suitable condition for strawberries, but where this has not been done it may be advisable to grow lupins, oats, or peas and dig them in some time before the strawberry plants are set out. An application of superphosphate, 1oz. per square yard, at the time when seed is sown will be found beneficial to the green crop.

When dry straw is used directly as humus material temporary nitrogen starvation may occur, because the bacteria in the soil require nitrogen to live while bringing about decomposition of the straw, and for food the bacteria draw on the soil nitrogen, locking it up and thus creating a deficiency. To overcome nitrogen deficiency and accelerate decomposition it is advisable to apply sulphate of ammonia or nitrate of soda at the rate of 5lb. per 1cwt. of straw.

As soil fertility cannot easily be improved after beds are planted, all applications of humus material must be made in the initial preparation. Crop size and quality can then be maintained by annual side dressings of organic and artificial manures.

Varieties

Most of the commercial varieties of strawberries now grown in New Zealand (Captain Cook and Chapman's Seedling, for example) have been propagated from chance seedlings, though there are others which resemble closely varieties known overseas, and which are descendants of imported varieties (Ettersburg Seedlings, Laxton's Noble, and Royal Sovereign, for example). In all varieties, however, there is considerable variation, the result, possibly, of the inclusion of seedlings of similar appearance among stock used for propagating.

It is advisable to obtain plants from reliable nurserymen who take care to rogue out diseased and weak plants. A list of some of the more popular commercial varieties in each district, with a description of each, is given below. It is suggested that these varieties would be most suitable for the home garden.

Care of Plants

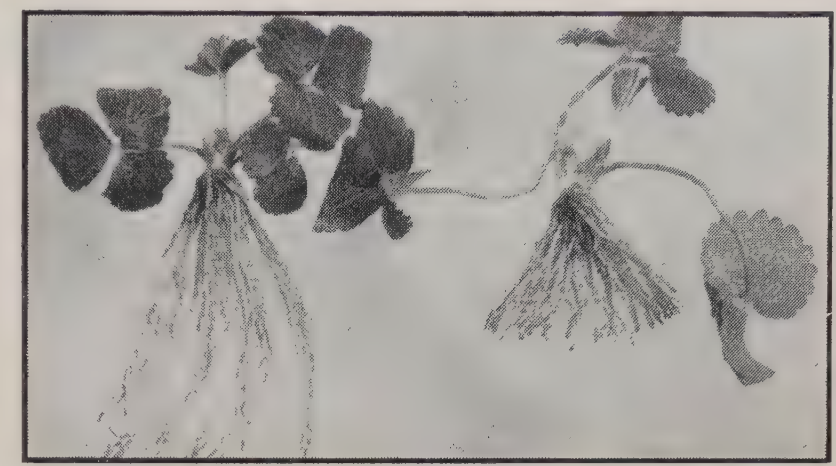
Before planting: It is best to delay delivery of plants until planting time so that there is as little upset as possible. Where this cannot be arranged the plants should be removed from the packages as soon as they arrive and if the roots have dried out, plants should be soaked in water for a short period and then immediately heeled in, in a well-drained, sheltered place. The best method is to dig a trench 6 or 8in. deep, preferably with one straight side, along which the plants should be set separately, making sure that the crowns are not too deep. The soil should be worked in carefully among the roots and firmed down to prevent drying out. The area should then be watered and maintained in good condition.

At planting: The roots should be cut back to about 3in. at planting to remove damaged and dead portions and to make planting easier—all the holes

DESCRIPTION AND DISTRIBUTION OF MAIN STRAWBERRY VARIETIES

Variety	District	Description
Captain Cook ..	A	Vigorous plants which carry foliage through the winter. Fruit firm and of fair quality. A good carrier.—Dessert.
Chapman's Seedling	N	A very vigorous plant of bushy habit which carries its foliage through the winter. Bears heavy crops of large, good-quality berries. Carries its fruit on strong, upright laterals well protected by the foliage so that it may not be necessary to mulch with straw to prevent mud splash and rots.—Dessert.
Ettersburg	H-W, N, C, O	There are several different seedlings grown under this name. Plants of bush type, fairly vigorous, which normally do not "run" as profusely as other varieties after the first year. Prolific crops of medium to small berries of good quality and particularly good flavour. The size of most of the fruits reduces its popularity as a commercial variety.—Dessert and jam.
Laxton's Noble ..	O	Fairly-vigorous plants which carry good crops of good-quality, medium to large fruits.—Dessert.
Madam Melba ..	H-W, C, O	Fairly-vigorous plants which lose their foliage in winter. Carries good crops of fairly-good-quality, medium to large berries.—Dessert.
Melody	H-W	Very like Madam Melba, but not quite as early, and a darker berry.—Dessert.
Royal Sovereign ..	C, O	Strong-growing plants which carry heavy crops of large, conical-, and wedge-shaped berries.—Dessert and jam.

A, Auckland; H-W, Hawke's Bay-Wairarapa; N, Nelson; C, Canterbury; O, Otago.



[*Sparrow Industrial Pictures Ltd. photo.*

Left—A plant with untrimmed roots. Right—A plant with roots trimmed ready for planting.

can be made the same depth to take the roots; if the roots are left untrimmed, holes of various sizes are necessary.

Damaged and diseased leaves should be cut off, leaving a crown with a few healthy leaves only. This will reduce loss of water through transpiration in warm climates and will permit the roots to develop without too great a check to the plant. All weak plants or plants with weak root systems should be discarded. Plants should be kept shaded to prevent drying out during planting.

Planting

It is best to plant in the autumn and winter, from late March till July, except where severe winter frosts occur. Autumn planting allows the plants to become established and to make some root development before winter halts growth, so that plants are ready to start into growth early the following spring. Growth will begin by the time the ground is in a fit condition for spring planting.

In districts where winters are severe spring planting is preferable, as autumn-planted strawberries may suffer from "heaving" during a period of heavy frosts. "Heaving" is the term applied to the lifting of soil and plants by frost when the ground beneath is frozen. Many roots are broken as a result and almost complete drying out of the plant occurs, often resulting in death or severe injury at least. "Heaving" may be eliminated or reduced by placing a few inches of straw over the bed as a mulch before frosts occur. The mulch must not be applied too early, as the plants may not be hardened sufficiently, in which case they will suffer winter injury. After frosts plants should be firmed in again by treading the soil on both sides of each plant.

Autumn planting has the advantage that crops can be harvested the following spring and summer, while with spring-planted strawberries it is preferable to remove flowers the first year and harvest the first crop a year later.

It is best to plant immediately after rain, but if this is not possible and the soil is at all dry, plants should be watered in after they are set. Conditions are best for planting on a cool, cloudy day or in the evening, when there is less water loss.

At time of planting the soil should be free working, firm, but not compact. Rows should be marked by a line and the plants set in the rows at the correct spacing. Use a trowel to dig the holes, which should accommodate the roots spread out without any doubling up. Soil should be worked in among the roots and firmed down with the knuckles or the trowel.

Care must be taken to ensure that plants are set at the correct depth; that is, the line dividing crown and roots should be at the soil surface level. Growth will be retarded and the crown may rot if strawberries are planted too deeply, with the crown covered; if the plants are set too shallow, the roots may dry out.

Systems of Planting

The system of planting will depend to some extent on the variety and on the incidence of weeds, but the three systems commonly used are as follows:—

Single row: This allows the maximum use of the push hoe for weeding and cultivation and reduces hand work accordingly. Rows are 2ft. apart, with plants spaced 12 to 15in. in the rows. There are two methods of carrying this system on in the second year. They are: (a) To remove all runners the first year as they appear and to maintain the bed as a series of single plants in rows. (b) To set two runners from each plant about 4in. outside the row, and intermediate between the parent plants, during the first autumn. This gives a wide single row and sufficient room (about 16in.) for cultivation between the rows.

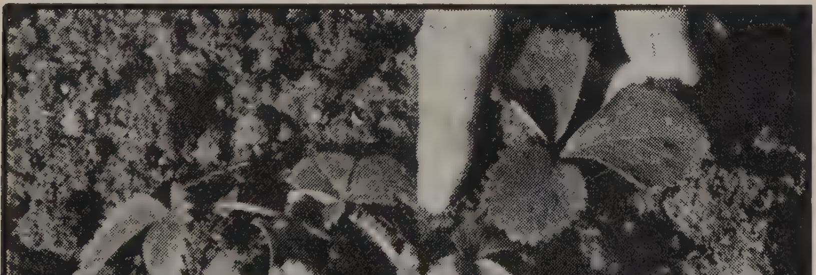
Double matted row: In the first year plants are set as in the single-row system. In the autumn runners are set about 6 to 9in. apart between each pair of rows so that a bed of plants more than 2ft. wide with plants at least 6in. apart will fruit the following year.

Triple matted row: Plants are set as in the single-row system and runners are struck 6 to 9in. apart between each set of three rows, so that at the end of the first autumn each bed is about 4ft. wide with plants at least 6in. apart.

The two matted-row systems increase yield, but usually at the expense of quality, and much more hand weeding and cultivation is required.

Barrel method: This method will appeal to those who have no space in the garden for a strawberry bed, to those who are keen to experiment, or to those who wish to produce strawberries earlier than their neighbours. The method may be used in glasshouses for producing out-of-season berries.

A 44-gallon drum, a supply of good soil, and some broken bricks or rubble are the main requirements to grow about three dozen plants. The top of the drum should be removed and holes punched in the bottom for drainage and ventilation. A series of holes



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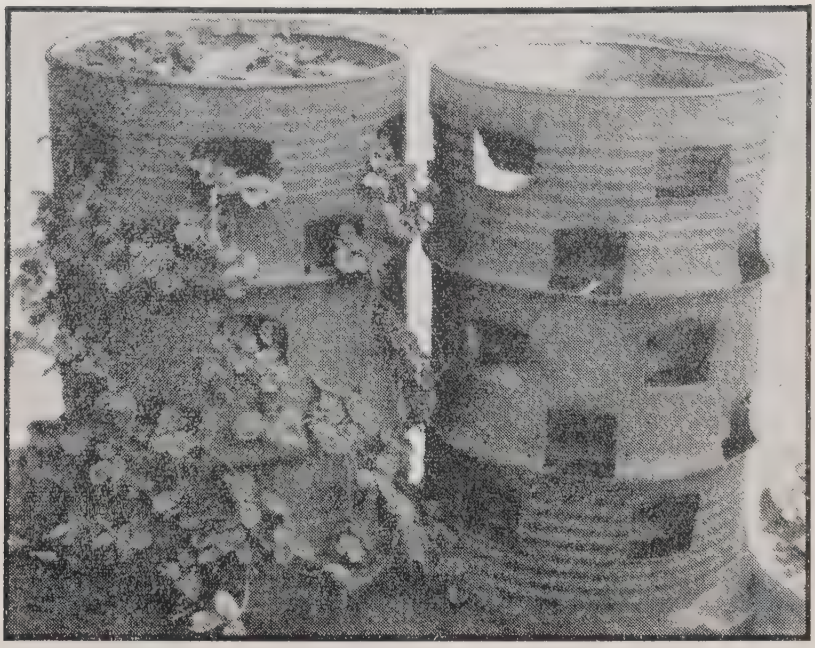
A healthy young plant just set out in the garden.



[N. W. Deverell photo.

Barrel method of strawberry culture, suitable for glasshouse or home garden where space is limited. Each 40-gallon drum will grow 37 plants (30 on outside and 7 on top).

4in. deep by 5in. long should be cut in the sides of the drum, cutting three sides of each hole, but leaving the fourth side so that the metal can be pushed in to form a lip (see the illustration above).

The first row of six holes, equally spaced, should girdle the drum about 9in. from the base, and there should be a further four rows each 9in. apart in which the holes alternate with the bottom row. This arrangement will give openings for 30 plants.

The bottom of the drum should be covered with a 2 to 3in. layer of broken bricks or rubble. A 6in. drainpipe placed upright in the centre of the drum should be filled with similar material, and as the drum is filled with soil the drainpipe should be raised according to the soil level until the drum is filled. The drainpipe should then be removed. When completed, the drum should contain about 12in. to 15in. of soil round a central column of rubble, which will afford adequate ventilation when the drum is raised from the ground on bricks in its permanent position. This should be warm and sheltered with ample light on all sides. The texture and composition of the soil are important—there must be adequate drainage, yet the soil should have good water-holding properties; therefore ample humus and sand must be incorporated. Before the drum is filled a base dressing of manure should be mixed into the soil. Soil should be firmed but not compacted as the drum is filled, and it should be watered thoroughly before planting.

At each opening in the drum the soil should be levelled off. The plants should be set from the outside, one in each opening, and a further seven on the top of the drum, allowing for 37 plants. If feeding and watering are carefully attended to, a good crop can be harvested about five months after planting.

Economic Life of Strawberries

In suitable ground of good fertility most varieties of strawberries will carry two crops of good-quality fruit, but usually it is not possible to maintain fruit quality during a third season; size deteriorates and most fruit is suitable for jam only. It is usually more satisfactory to destroy plants after their second crop and to plant a new bed on another part of the garden.

Cultivation

As strawberries are shallow rooting, cultivation after planting should not be deep, especially close to the plants. The push hoe or tined drag hoe is best for destroying weeds and for maintaining a shallow tilth, which gives aeration and allows root development. Cultivation should proceed at short intervals up to fruit set, when straw mulch should be applied. After the first crop has been harvested cultivation of the bed should continue at intervals through the autumn to ensure that the plants are in the best condition possible to carry a second crop the following spring.

Where winter and early spring weed growth is excessive occasional winter cultivation, when soil conditions permit, will reduce the spring work.

Mulching

It is usually necessary to mulch beds with straw about the time the first fruits are setting. Mulching conserves moisture and prevents packing of the soil. It restricts weed growth, saves fruit from being splashed with mud, and reduces damage to fruit through contact with the soil. Mulching may not be necessary on sandy soils, especially in areas of low summer rainfall, or with bushy, upright varieties which have strong, upright fruiting laterals and ample foliage to protect the fruit.

Clean grain straw is commonly used for mulching and is preferable to hay, which tends to pack down and to bring in weed seeds. The straw should cover the bed to a depth of about 2in., care being taken to place the mulch under the plants.

Manuring

The application of manures—organic or artificial—will not compensate for lack of humus, but if used wisely they will supplement natural soil fertility by providing a source of readily-available plant foods, which will give increased plant growth and vigour and

[*Sparrow Industrial Pictures Ltd. photo.*

Hoeing between the plants before mulching.

larger fruit. It is not possible to state exactly the quantity of manure to be applied; this can be ascertained only by experiment on individual gardens.

A mixture containing nitrogen, phosphorus, and potash usually gives much more satisfactory results than one in which any of the three constituents is omitted.

Nitrogen may be supplied as blood and bone, dried blood, fish manure, or sulphate of ammonia; phosphorus as superphosphate; and potash as sulphate or muriate of potash.

Time of application: A base dressing of a balanced mixture consisting of plant foods which will become available over a fairly-long period should be broadcast over the bed before planting and worked in during final cultivation. A suitable dressing is blood and bone 3 parts, superphosphate 3 parts, and potash 1 part (all by weight). This should be applied at the rate of 4 to 12oz. a square yard.

In second-year beds spring applications of manure should be made two or three weeks before growth commences and the manure incorporated with the soil by early cultivation. A good mixture is blood and bone or dried blood 1 part, sulphate of ammonia 1 part, superphosphate 4 to 6 parts, and potash 1 to 2 parts (all by weight). The mixture should be applied at the rate of 2 to 4oz. per square yard. When muriate of potash is used it should be applied several weeks before growth starts, or damage may result.

Applications of manure during the growing season should be sufficient to maintain plant vigour and fruit size. Dressings should consist of manures which will be fairly readily available to the plants. A good mixture is: Blood and bone or dried blood 2 parts, sulphate of ammonia 1 part, superphosphate 1 part, and sulphate of potash 1 part (all by weight). This should be applied at the rate of 1oz. to the square yard, the initial application to be made when the first blossoms appear and later applications at about 3- or 4-weekly intervals. Muriate of potash should not be used at this time. Care should be taken to see that sulphate of ammonia and superphosphate do not come in contact with the foliage, as either may cause serious damage, especially when the plants are wet. Manuring should not be done on windy days and the mixture should be spread carefully on the soil, not broadcast.

Spraying

Adequate and timely control or prevention of diseases and pests by spraying will more than repay the cost and work involved. Knapsack or bucket-type pumps are suitable for the home garden.

As efficiency in spraying depends on time of application, thoroughness, and speed, all equipment should be in good order and the necessary specifics available when required. Care must be taken to spray at the correct concentrations. A mixture which is too strong may cause damage; one that is too weak will not be effective and is a waste of time and money.

Dusting with appropriate specifics can replace spraying. Dusting is fast and satisfactory and efficient guns for this work are cheap.

[*Sparrow Industrial Pictures Ltd. photo.*

Part of a bed which has been mulched.

Treatment of Beds after Harvest

Strawberry beds should be given their autumn treatment immediately harvesting has been completed. On one-year-old beds the mulch should be lifted with a fork, dried, and burnt or put on the compost heap. All diseased, dead, and damaged plants should be removed and destroyed. The beds should be cultivated and when necessary given an autumn dressing of manure, the benefits of which will show the following season. As soon as runners are sufficiently developed they should be set in their permanent positions, and all superfluous runners should be removed. Spraying to control diseases and pests should be done. With two-year-old beds all plants should be dug out and burnt, and the ground prepared for some other crop.

Control of Pests and Diseases

The principal diseases and pests of strawberries and control measures are as follows:—

Virus Diseases

Virus diseases, which have a degenerative effect, are transmitted by only one species of aphis (*Pentatrichopus fragariae*) and are usually introduced into strawberry gardens by the planting of infected runners. They are the most serious diseases affecting strawberries in New Zealand or elsewhere and probably have been the prime factor in reducing areas and yields in New Zealand during the past 10 years. Two strains of virus peculiar to the strawberry produce conditions known as "yellow edge" and "crinkle" respectively.

Yellow Edge

This causes a general dwarfing of the youngest leaves and a shortening of the petioles, together with a yellowing of the leaflets, which is more pronounced at the edges. The plant appears flattened compared with a healthy one because of the dwarfing of the petioles of the leaves in the centre of the plants.

Crinkle

This may be as prevalent as yellow edge in some districts. The symptoms are crinkling of the young leaves accompanied by chlorotic spots (with or without small, red, necrotic centres) and a dwarfing of the plants.

Mild infections of crinkle, or yellow edge, can be detected only by the symptoms described, and often not until autumn, as hot weather tends to mask the disease. Symptoms usually become visible as temperatures moderate. Severe infections, however, can be detected easily. Symptoms are: General dwarfing of the plant, failure to carry good fruit, and failure to develop normal runners.

Control: Plants affected by virus diseases do not recover and should be rogued and destroyed by burning as soon as the infection is detected. The degree of spread may be reduced by controlling the aphis which transmits the virus. This may be done by spraying with nicotine sulphate.

Fungus Diseases

Leaf Spot (*Mycosphaerella fragariae*)

Leaf spot is probably the most common fungus disease affecting strawberries in New Zealand. Attacks are usually confined to the foliage, where the symptoms show as small circular spots, reddish-brown at first, but later becoming greyish from the centre outward, with a reddish margin. The spots enlarge and may coalesce so that the functional area of the leaf is reduced, thus restricting growth of the plant. The disease is rarely serious, but where infection is severe some of the outer leaves may be killed. Some varieties of strawberries are more susceptible to attack than others.

Control: Spray in spring with Bordeaux 5 : 4 : 50 (6½oz. bluestone and 5oz. hydrated lime to 4 gallons of water). Later applications of Bordeaux 3 : 4 : 50 (4oz. bluestone and 5oz. hydrated lime to 4 gallons of water) may be necessary up to fruit set.

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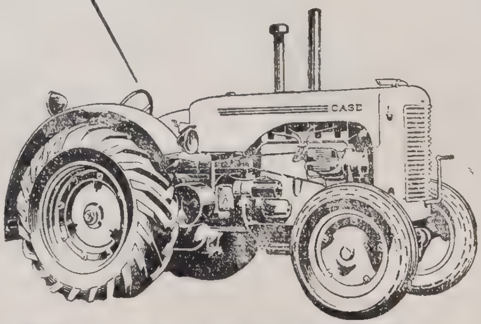

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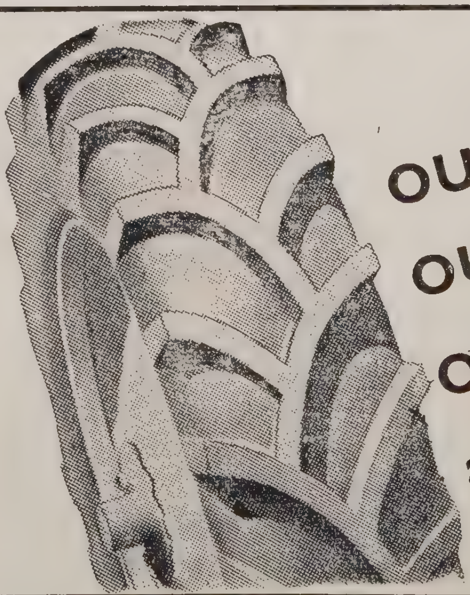

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GROWING STRAWBERRIES IN THE HOME GARDEN

[*Sparrow Industrial Pictures Ltd. photo.*

Part of a strawberry bed in a small home garden. Note the two virus-infected plants (with small leaves) in the row at left.

After harvest, beds should be sprayed with Bordeaux 3:4:50 or burnt off by lifting the mulch on top of the plants to dry and firing so that a quick burn is achieved. This will destroy infected leaves and insects without injuring the crowns. If mulch is not used the tops can be scythed and burnt when dry.

Root Rot

Root rot is usually considered to be a physiological trouble associated with the presence of excess water round the roots for a prolonged period. The disease has caused serious losses in strawberry gardens, particularly in the Auckland district. In other districts the trouble has not been so widespread, because the soils used for strawberries are comparatively free draining.

Plants affected by root rot start into normal growth in the spring, but when the food stored in the plants has been used growth is retarded and the plants remain dwarfed. When plants are lifted it will be found that most of the roots are blackened and dead and healthy feeding roots lacking or very restricted and confined to the area immediately below the crown—that is, just below the surface, where they will be affected immediately by dry conditions. Whatever the condition of affected plants little if any fruit will mature. It is generally believed to be unwise to replant in areas which in the past have been seriously affected by root rot.

Control: As this trouble is almost invariably associated with waterlogged conditions, adequate drainage should provide effective control. Deep digging with the slope, the breaking of any clay pan which retards the escape of water, and the levelling of the garden to eliminate depressions will do much to assist drainage. Gardens which have been affected by root rot should be avoided when planting stock is being selected, as the root development of plants from such gardens will not be good.

Insect Pests

Grass-grub (*Odontria zealandica*)

The grass-grub, larva of one of the native cockchafer beetles, feeds on the roots of many plants including grasses, strawberries, and raspberries, causing damage by reducing the ability of the plant to take in food from the soil. Even one or two grubs per strawberry plant may cause serious injury and prevent the development of an economic crop. The pest is more serious in lighter soil and in areas surrounded by pasture or in land which has recently been in pasture.

The adult, a brown beetle, which swarms at dusk during November and December, feeds on foliage of many plants and lays its eggs in the soil among the roots of grass, strawberries, etc. Larvae, after hatching, feed on the roots and emerge as mature beetles.

Control: The only satisfactory method of control is to broadcast arsenate of lead powder at the rate of 1oz. per square yard over the whole area and work it into the top 2 or 3in. of soil just before planting. In gardens to be maintained on the single-row system an alternative method is to apply arsenate of lead powder to strips 6 to 8in. wide where rows are to be planted. The grass-grub feeds on the soil and the roots and in doing so ingests a toxic dose of arsenate of lead.

Observations have shown that applications of arsenate of lead are effective for from 3 to 5 years. Some growers may feel that the treatment will be harmful to plant and fruit, but such is not the case, as arsenate of lead does not enter plant tissues.

Red Spider (*Tetranychus telarius*)

Red spider is one of the worst pests affecting strawberries in some areas and is usually more serious on second-year beds because of early re-infestation from eggs carried over from the previous season. Periods of dry weather early in the growing season are conducive to attacks and the population builds up rapidly if control measures are not soon taken. The red spider lives on the under surfaces of leaves. It is protected by webbing, and it feeds on the sap, causing collapse of cells and debilitation of the plant. Heavy rain and colder temperatures will check the pest, but severe damage may be done before a natural check occurs.

The webbing protection and the fact that the spider lives on the underside of leaves make it imperative to spray thoroughly with adequate pressure so that the entire plant surface is covered.

Control: Spray with 1 per cent. summer oil (6½ fl. oz. to 4 gallons of water) when red spiders are first seen and 10 to 14 days later to kill any which hatch after the first spray. The addition of nicotine sulphate 1:800 to the summer oil solution may be more effective than summer oil alone, but the efficacy of nicotine sulphate is reduced in cool, windy weather; best results will be obtained only on hot, still days. Where a combined spray is used, add 6½ fl. oz. summer oil and 4/5 fl. oz. nicotine sulphate to 4 gallons of water.

When red spider is on the increase dusting at intervals with flowers of sulphur will assist control, but sulphur should not be applied when the fruit is ripening.

Strawberry Aphis (*Pentatrichopus fragariae*)

Attacks by strawberry aphis are common throughout the country, but only occasionally does infestation reach such serious proportions that it devitalises plants through the amount of sap extracted and so causes crop reduction. The aphis must be considered a serious pest even where it appears in small numbers, because it is the sole means of transmitting the virus diseases affecting strawberries. The aphides transmit virus by feeding on the sap of infected plants, from which they absorb the disease, later injecting virus into healthy plants when these in turn are attacked. The result can be a considerable reduction of the crop in a season. Aphides multiply very rapidly and control measures should be adopted as soon as they appear.

Control: Periodic spraying with one of the following specifics will control the aphides:—

1. One per cent. summer oil (6½ fl. oz. to 4 gallons of water).
2. One per cent. summer oil, plus nicotine sulphate 1:800 (6½ fl. oz. summer oil and 4/5 fl. oz. nicotine sulphate to 4 gallons of water).
3. Nicotine sulphate 1:800, plus soft soap (4/5 fl. oz. nicotine sulphate and 2 to 2½oz. soft soap to 4 gallons of water).—Soft soap must be used as an activator when nicotine sulphate alone is used.

Nicotine sulphate should be 40 per cent. strength. That is the normal strength of commercial preparations, but if specifics have concentrations of nicotine greater or less than 40 per cent., the dosage should be relative.

Summary of Seasonal Operations

1. Prepare the ground thoroughly before planting. Build up fertility and cultivate deeply and thoroughly.
2. Use only the best plants; well-rooted, disease-free plants will ensure better crops of better-quality fruit.
3. Maintain clean cultivation throughout the season.
4. Spray thoroughly to control diseases and pests with recommended specifics at the correct concentrations. Spray at the correct times—delays may result in reduced crops.
5. Do not neglect the bed as soon as picking has finished, but carry out all the necessary work to ensure that plants are in the best condition to carry the next crop.
6. Destroy all diseased plants as soon as they are noticed.

When in doubt about disease identification and control, or when requiring advice on any cultural problems, commercial or domestic growers should contact district officers of the Horticulture Division, Department of Agriculture.

Acknowledgments

The writer wishes to acknowledge the assistance of officers of the Plant Diseases Division, Department of Scientific and Industrial Research, in editing the section dealing with diseases and pests.

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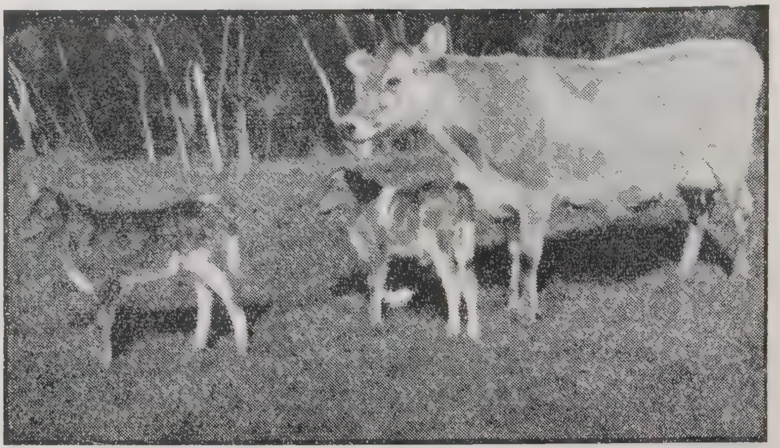
* * *

Jersey Cow's 9 Calves in 4 Years



AN interesting study in the breeding capacity of a dairy cow is provided by a cow owned by Mr. J. Wright, of Miranda, Franklin County. The cow, which is a 6-year-old Jersey of average size, has produced 9 calves in 4 years. In her first two seasons she produced two sets of twins, and in her third season she bore triplets whose total weight was 182lb. This season she has again produced twins, with which she appears in the illustration above.

—*W. L. STRINGER,*
Inspector of Stock, Department of Agriculture, Thames.

Fruit Crop Estimates for March, 1949

THE following estimates of the fruit crop for March, 1949, in 000's of bushel cases, are provisional and revised monthly for the period November to March and are summarised from information supplied by field officers of the Horticulture Division, Department of Agriculture.

FRUIT	DISTRICT									
	Auckland	Gisborne	Hawke's Bay	Manawatu Wanganui	Wairarapa	Nelson	Marlborough	Canterbury North Otago	Central Otago	Total
APPLES—										
Ballarat	38	8	60	1	1	7	5	8	2	130
Cox's Orange Pippin	6	3	60	1	1	89	7	12	8	187
Delicious	28	8	95	2	5	133	18	26	44	359
Dougherty	17	5	60	—	—	21	2	—	—	105
Granny Smith	53	2	100	2	2	56	2	2	2	221
Gravenstein	22	—	35	—	—	42	1	1	1	102
Jonathan	9	—	40	—	1	209	18	13	14	304
Sturmer	5	5	180	5	13	286	22	44	30	590
Other varieties	81	4	141	3	2	116	15	51	42	455
Total	259	35	771	14	25	959	90	157	143	2453
PEARS—										
Beurre Bosc	4	—	3	—	—	7	—	—	—	14
Louise Bonne de Jersey	—	—	17	—	—	—	—	—	—	17
Packham's Triumph	7	—	4	—	—	2	—	—	—	13
P. Barry	4	1	15	—	1	3	—	1	—	25
W. B. Chretien	17	—	40	—	—	25	—	2	6	90
Winter Cole	1	1	50	—	1	20	1	5	2	81
Winter Nelis	—	1	55	—	—	8	—	1	4	69
Other varieties	20	1	8	2	—	8	1	7	5	52
Total	53	4	192	2	2	73	2	16	17	361
OTHER FRUITS—										
Peaches	39	6	250	1	—	55	4	7	87	449
Apricots	1	—	2	—	—	—	—	8	118	129
Nectarines	1	1	20	—	—	1	1	2	18	44
Plums	45	6	43	1	—	8	1	6	23	133
Cherries	—	—	1	—	—	1	1	2	8	13
Quinces	9	1	9	—	—	9	—	—	1	29

HEADING PHOTOGRAPH: **To maintain the cows' body weights throughout the year, enough roughage and supplementary foods, such as hay, must be saved to prevent a drop in condition before calving and to add bulk and energy to the diet when immature pastures are being grazed in spring.**

Winter Feeding of Dairy Cows

WINTER feeding of stock is probably the most important part of the dairy farmer's seasonal operations, for the cows' production in spring depends on how they are fed in winter. The growing and saving of winter feed in such forms as clover hay, lucerne hay, silage, autumn-saved pasture, roots, chou moellier, and oats have reached dimensions which indicate that all farmers recognise the need for extra winter feed for dairy cows.

MOST farmers know how to budget for winter feed for their herds to suit their own requirements and local conditions within fairly-narrow seasonal limits. However, a few are not wholly conversant with this part of their farming operations, perhaps being new to a district or just starting dairy farming, and others may wish to change methods which are not standing up to the test of butterfat per acre. In all such cases of doubt the local Instructor in Agriculture should be consulted; he knows local conditions and can give advice on growing and saving feed to suit herd requirements, soil, and climate. The best methods of supplying the feed to the wintering cow are the main concern of this article by W. D. Ross, Veterinarian, Department of Agriculture, Palmerston North.

Most Critical Time of Cow's Life

The wintering dairy cow is at the most critical time of her life. She has finished a season's milking, is carrying a calf, and must build up her own body and that of the calf and have a reserve of stamina for the spring. All this must be accomplished on the food she is given in the winter.

The main object is to build up the cow for the best return in the spring and summer. That means the highest sustained production that can be obtained up to the limit of the cow's capacity to turn feed into milk. Beyond this limit come the signs of overstrain, slips or non-contagious abortion before calving, and after-calving milk fever, grass staggers, and ketosis, the so-called metabolic diseases. Metabolic diseases are the visible effects when the body can no longer cope with the process of building up feed into living matter and breaking it down into energy and milk, either because the animal cannot obtain or digest enough feed or because the body is not in a fit state to utilise the feed provided.

Unfortunately, the balance between fitness and unfitness is very fine in a high-producing cow and very little strain may upset it. For an understanding of the whole problem, the high-producing cow must be regarded not as just a machine but as the very highly-specialised product of years of careful breeding, testing, and selection for milk production.

Production at Expense of Health

The stage has now been reached at which a high producer will milk heavily after calving in response to the stimulus of calving and the way in which she has been bred, whether feed is sufficient or not. If feed is deficient in either quality or quantity, her body cannot withstand the heavy drain on her reserves of proteins, fats, and minerals; these are soon depleted or out of balance and she falls an early victim of one or more of the metabolic diseases. So strong is this urge to give milk, even at the expense of her own health, that it is quite usual for a well-bred high producer to lose 100lb. of body weight during the first 2 months of heavy milk production in the spring flush and yet remain normal in health if properly fed.

Highly - developed specialisation makes the cow her own worst enemy and leaves her helpless to ward off the effects of bad management. She cannot merely produce to suit the feed, but must produce in the first flush even to the stage of endangering her own life. That is contrary to the laws of Nature, and if left to her own devices on rough feed, this type of cow would breed itself out because of slips and deaths in early spring and infertility in late spring and summer, leaving only the low producers. Elimination of the high producer is very evident on the low-average or poor farm where the high producers slip or go down with milk fever, ketosis, and

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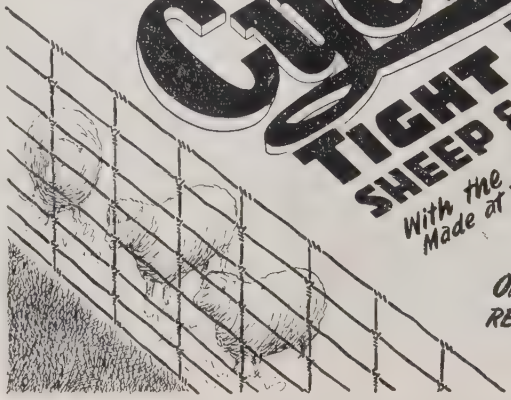

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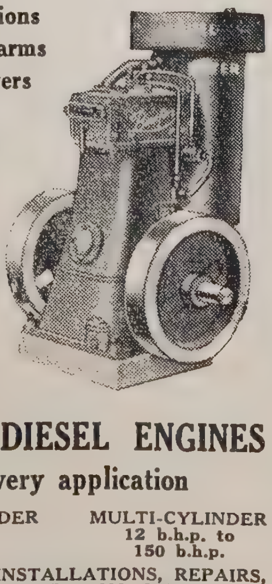

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grass staggers, or go dry after a few weeks, while the rest of the herd goes through the season but gives very poor butterfat returns.

On the other hand, New Zealand's highly-specialised grasses have evolved to the stage at which more dry feed can be produced from an acre of grass, and therefore more food products per unit of labour, than in any other country in the world. These grasses, if used properly, are the finest feed availabe for dairying and can stimulate milk production to such a degree that the early flush of protein-rich pasture, if fed without good hay or roughage, drives the high producer to even greater production, whether her body balance can withstand the strain or not. That again gives rise to metabolic diseases if the stock are badly managed, and such pasture can be very dangerous in the hands of a careless farmer.

Thus, the farmer's own cleverness in evolving the high-producing cow and high-producing grasses has made the co-ordination of cow and grass a very delicate operation.

Guides for Winter Feeding

Years of careful research work, field experiments, and the practical experience of veterinarians and farmers have established a few broad guides for the winter feeding of the dairy cow. These guides aim to adjust the high producer to the highly-intensive milking plan and the milk-stimulating pastures so that maximum production can be obtained with the minimum of disease. The metabolic diseases cannot be eliminated, as the balance is upset by many unforeseen factors, such as indigestion and bad weather, but the major predisposing causes can be largely overcome by following a few simple guides which allow some latitude to suit most conditions of weather and farming.

Cows must be kept at about the same body weight throughout the year, particularly during winter and early spring. In practice it is found better to save feed in autumn, if it is short, and allow cows to fine down a little then, than to have them on short rations immediately before or after calving.

If feed is reduced before calving, the cow's essential mineral and body resources become depleted and in bad cases heifers and young cows will slip their calves. That is a frequent cause of non-contagious abortion, and in a season when feed is short is very prevalent. However, the older cow carries on to deplete herself thoroughly and is a fit subject for milk fever a few days before or after calving. The calf of such an undernourished heifer or cow often is born dead, or may be alive but small and weak, subject to scours, and very hard to rear into a worth-while animal. These weakly calves are often born about a fortnight before their time.

The underfed cow may come safely through calving and milk for about 6 weeks until the peak of production finds her out and she contracts ketosis because she must use up what body fat she has left for milk production and she receives insufficient sugar-rich foods such as mature grass, hay, or molasses to burn the fats up completely, leaving excess ketones circulating in her bloodstream. She becomes a "dopy," rough-coated wreck and practically goes out of production if not treated with plenty of molasses, good feed, and extra minerals.

Milk fever, of which this comatose cow is a typical case, can be caused by milk production being forced too rapidly.

At about the same time, or often a week or two earlier, cows underfed in winter or suddenly changed from a good diet of hay and young grass to young grass alone are very subject to grass staggers. In this condition magnesium salts are short in the bloodstream, and one of the magnesium salts, usually Epsom-salt, has to be used to make up the deficiency. It can be given by the mouth in a mild case and injected under the skin or into a vein in a bad case. In some districts Epsom-salt is added to the drinking water. Deaths are very common in grass staggers cases if they are not treated in time, and again the high producer short fed in winter suffers most. Grass staggers can affect the high producer at any time in the season and can be brought on by a sudden change in feed, indigestion when she cannot absorb enough feed, bulling when her grazing habits are upset, or even by a spell of bad weather causing her to use too much of her energy to keep warm.

Some cows that go dry for no apparent reason seem to save themselves from the metabolic diseases by stopping milk production and using the available food to build themselves up again. Farmers seldom realise that 3 times as much feed is required to keep a cow in high production as to feed a dry empty cow and keep her in health. Departmental officers are often told that a certain cow came in, milked outstandingly well for a few weeks, then just went dry and is being fattened for the works. In most cases she is a well-bred high producer, and poor winter feeding can be blamed.

A few cows that calve in poor condition may build themselves up before they reach peak production, thus making a late start; in many cases they go dry earlier.

Cows which calve in low condition are the majority of what are called temporary sterility or delayed conception cases. Their bodies are not in a fit state for them to hold to the bull and milk at the same time. This trouble is rare in cows which are maintained on a good, balanced ration during pregnancy and lactation. A young heifer which is badly done in her first winter is often under-developed sexually and may not hold until she is 2 years old. Farmers who try to breed fine-boned, small, "typey" cows tend to keep heifers too low in condition, causing a lot of trouble of this nature.

Dangers of Immature Feed

In herds where delayed conception is a serious problem it is very noticeable that when the stock are moved to more mature feed, or when the feed matures in January or February, cows hold without much further trouble. Moving cows from lush, young, milk-producing grass to older pastures, or feeding supplementary hay or roughage, is not a popular cure for falling production, but sustained production is impossible on unbalanced rations without paying the price in herd replacements.

A common source of trouble is allowing a high producer to build up too much condition during the last month of pregnancy, or wintering her too fat, and then immediately after calving feeding her on young, stimulating, flushing pastures. The stimulus for milk production from the high condition and the milk-forcing grass is too much for the cow's system, as it

[*Sparrow Industrial Pictures Ltd. photo.*

Covers are a valuable aid to the maintenance of the condition of stock in cold, windy weather.

causes an excessive milk drain and a heavy, sudden fall in minerals, resulting in milk fever, grass staggers, or ketosis caused by excessive conversion of fat reserves on a protein-rich pasture which lacks the necessary sugars to burn fats completely. Deaths are frequent in this type of cow from a combination of all three conditions, which makes treatment very difficult. If such cows were fed more hay in early lactation, they would not get an excessive amount of young grass and would have a more balanced food and more time to balance their excess fats from too much winter feed.

The same circumstances operate when a farmer buys a few well-conditioned, in-calf high producers and adds them to an average herd on average feed. These cows are accustomed to better feed management, and the sudden change thoroughly upsets their fine balance. If they do not slip, they go down after calving with milk fever, grass staggers, or ketosis and go dry early. The average cows in the rest of the herd, accustomed to low conditions and not having the same fatal urge to produce, go serenely through the season with few troubles. Further, the high producers left probably suffer from delayed conception, and the farmer swears he has been robbed, not realising that the whole sad tale was his own fault.

Maintenance of Body Weight

Each farmer must adjust his feed to suit season, pasture, and herd so that each cow is maintained at about the same body weight throughout the year. That means saving enough roughage and supplementary foods such as hay and roots to prevent a drop in condition before calving and to add bulk and energy to the diet when immature pastures are being grazed in spring. Extra feed will help to smooth out any dangerous sudden changes in the quantity or quality of pastures. At least 15cwt. of hay or its equivalent should be saved for every cow wintered.

Adequate shelter belts and good covers are invaluable in cold, windy weather.

After a hard winter, molasses and a few pounds of concentrates in the bail may contribute much toward saving a high producer from milk fever, grass staggers, or ketosis.

A cow should not be allowed to build up too much condition immediately before calving, and she should not be milked right out for a few days after calving to avoid milk fever.

A little extra attention during the first heat period, in the form of extra good feed and molasses, will carry a cow safely over the danger period. Over-exciting or dogging should be avoided. Indigestion, the forerunner of many cases of grass staggers and ketosis, can be avoided by using only good-quality feed. Mouldy hay is dangerous.

Well-wintered cows have stronger calves, milk better for longer, and are easier to get in calf than those which are less well treated.

DAIRY PRODUCE GRADED FOR EXPORT

THE following figures showing quantities of dairy produce graded for export during February and for the 7 months ended February 28, 1949, with comparative figures for the same month and 7-monthly period of last year, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER—

	Tons			Tons	
Period	Creamery	Whey	Total	Percentage inc. or dec.	Total in store at end of mth.
February, 1949	14,804	287	15,091	+ 11.545	26,698
February, 1948	13,257	272	13,529	—	41,810
Increase or decrease	+ 1,547	+ 15	+ 1,562	—	— 15,112
For 7 mths. ended 28/2/49	113,995	1,988	115,983	+ 4.829	—
For 7 mths. ended 29/2/48	108,772	1,868	110,640	—	—
Increase or decrease	+ 5,223	+ 120	+ 5,343	—	—

CHEESE—

	Tons			Tons	
Period	White	Coloured	Total	Percentage Inc. or dec.	Total in store at end of mth.
February, 1949	9,572	828	10,400	+ 9.324	22,224
February, 1948	9,513	—	9,513	—	20,102
Increase or decrease	+ 59	+ 828	+ 887	—	+ 2,122
For 7 mths. ended 28/2/49	66,428	3,469	69,897	+ 8.938	—
For 7 mths. ended 29/2/48	64,162	—	64,162	—	—
Increase or decrease	+ 2,266	+ 3,469	+ 5,735	—	—

If these figures are converted into butterfat equivalent, there is an increase of 5.699 per cent. in butterfat graded for the 7 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

Control of Opossums an Urgent Problem

CONTROL of opossums is now a pressing problem in farming and orchard districts, in exotic and protection forests, and even in home gardens. In the hope that it will encourage greater interest in the trapping of a serious pest two articles covering all the aspects of opossum hunting have been compiled by L. T. Pracy, Field Officer, and R. I. Kean, Biologist, Wild Life Branch, Department of Internal Affairs. Because it is felt that insufficient knowledge of the behaviour of the animal itself may deter some, particularly young farm workers, from attempting trapping, this article deals fully with the life history of the opossum, its habits, and its food preferences. A second article will discuss trapping and general methods of control, skinning, and care of skins.

THE opossum which is found in New Zealand is an Australian marsupial or pouched animal belonging to the family *Phalangeridae*. Many kinds of opossums occur in Australia, Tasmania, New Guinea, and neighbouring islands. All members of this family are herbivorous, living on vegetable matter, but confusion in respect of food habits is sometimes caused by reference to the American opossum, which is an omnivorous animal belonging to a different family.

The species of opossum liberated in New Zealand, *Trichosurus vulpecula*, occurs naturally throughout Australia, Tasmania, and neighbouring islands. The species is a compound one, that is, it contains animals that vary greatly in size and colour and some eight sub-species or varieties have been described. The characters of some of these sub-species are sometimes considered to be sufficiently distinctive to entitle them to full specific rank.

Liberations of opossums in New Zealand were made at various times in the latter half of last century by private individuals, acclimatisation societies, and the Government, but it is not possible to ascertain what varieties were acclimatised owing to the incompleteness of early records. The situation has been further confused by numerous liberations in new districts of opossums trapped in areas stocked earlier. Some eight or nine types are distinguished by skin dealers, but these do not correspond to the described Australian races. Further, it seems probable all varieties of opossum found in New Zealand interbreed. It appears futile, therefore, to attempt any separation into sub-species at this stage.

Introduced with a view to establishing a valuable fur industry, the opossum increased rapidly. Its potentiality for damage to orchards, gardens, and plantations was recognised at an early stage, but for some time it was considered an unqualified asset in bush lands.

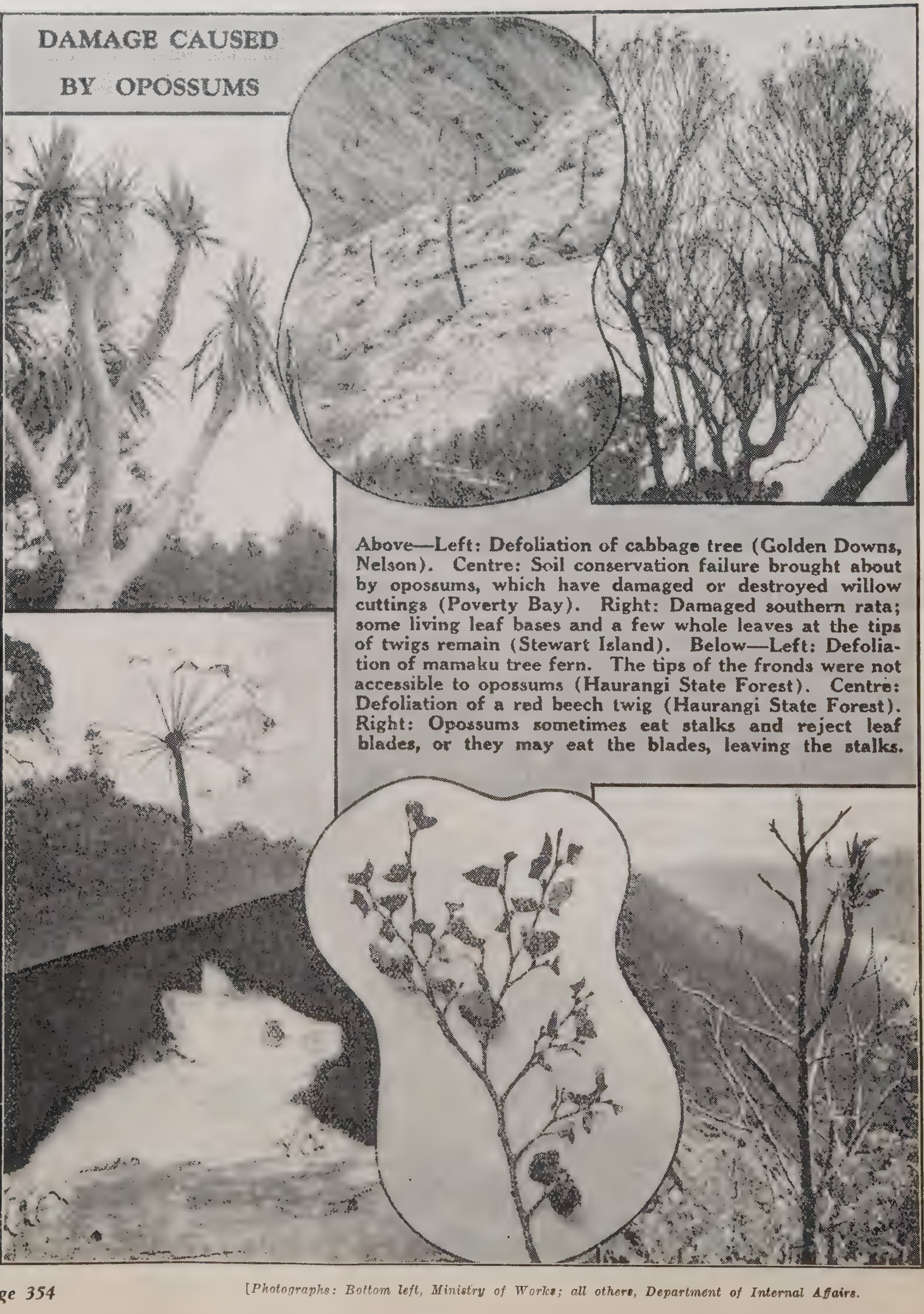
A scientific investigation was made by Professor H. B. Kirk, and his report, presented to Parliament in 1920, showed that adverse effects upon native forest were negligible. Further liberations were recommended in all forest districts except where these were fringed by orchards or exotic plantations. In 1928 the State Forest Service prepared a report on the opossum industry in New Zealand and again it was concluded that very little real damage was done to either bush or native birds.

Subsequent to this period cumulative effects of constant browsing pressure upon protection forest started to become evident, and the opossum began to be viewed in a new light. Further charges were levelled at the opossum: Electric power boards suffered increasingly from short circuiting of high-tension wires, and catchment boards, set up under the Soil Conservation and Rivers Control Act, 1941, found the presence of opossums incompatible with reclamation measures on deteriorated farm land in the drier districts. It was apparent that the earlier views on the opossum and the fur industry would have to be revised. The new evidence conflicted sharply with the recorded data and the whole situation showed the need for basic research.

The first step taken in this direction was to set up an experimental station in a healthy bush area which carried a moderate population of opossums. There the normal habits of the opossum were studied in some detail, effects upon the bush being recorded primarily as field notes. These were confirmed by analysis of stomach contents and

Heading photograph by Public Works Department.

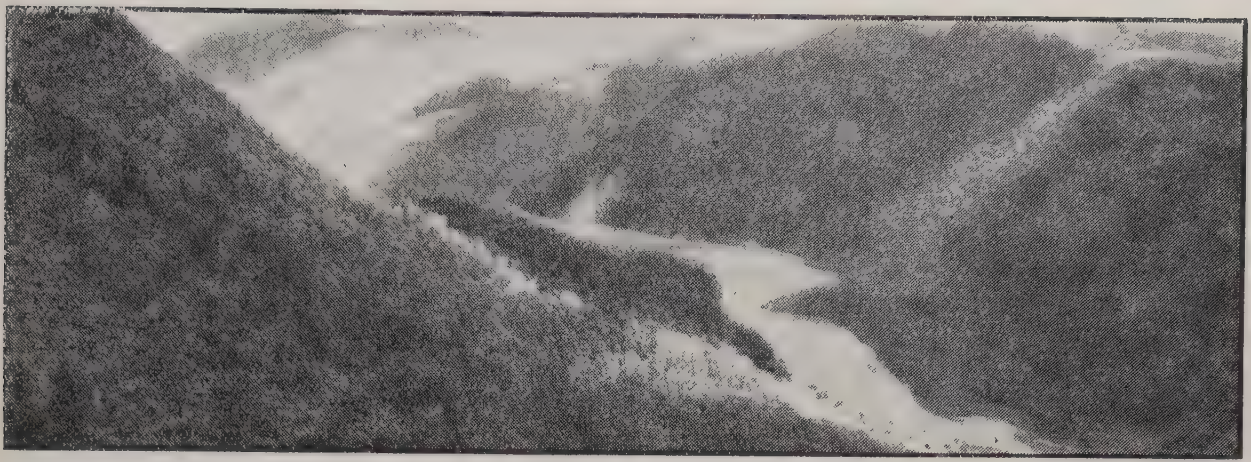
DAMAGE CAUSED BY OPOSSUMS



Above—Left: Defoliation of cabbage tree (Golden Downs, Nelson). Centre: Soil conservation failure brought about by opossums, which have damaged or destroyed willow cuttings (Poverty Bay). Right: Damaged southern rata; some living leaf bases and a few whole leaves at the tips of twigs remain (Stewart Island). Below—Left: Defoliation of mamaku tree fern. The tips of the fronds were not accessible to opossums (Haurangi State Forest). Centre: Defoliation of a red beech twig (Haurangi State Forest). Right: Opossums sometimes eat stalks and reject leaf blades, or they may eat the blades, leaving the stalks.

[Photographs: Bottom left, Ministry of Works; all others, Department of Internal Affairs.

LIFE HISTORY OF THE OPOSSUM



[*Ministry of Works photo.*

Part of the block in the Orongorongo Valley in which the Wild Life Branch carried out investigation into opossum damage.

by direct observation of opossums kept in a bush enclosure under approximately natural conditions. In addition to research full commercial trapping was undertaken to test the relative efficiency of the various methods of trapping. Close attention was also given to the preservation of skins. These were numbered so that a particular skin could be traced from the trap line and date of capture, through to the final classification and grading in the commercial skin store.

Life History

Few invariable rules can be made concerning the opossum, for variability seems to be one of its outstanding characteristics, which is to be expected in an animal coming from a vast territory like Australia, with its wide range of climate. Irregularity has its effect on all stages of the life history, and, in addition, has a bearing upon seasonal fur condition and values. The investigation undertaken by the Wild Life Branch, during the limited time it has been carried out, has not produced any clear picture, but on the contrary, has raised many more questions than it has answered.

Breeding Season

Females are to be found with young throughout the year, but the earliest births of a season can be said to occur about the beginning of April. From the middle of the month numbers rise rapidly, reaching a peak at the end of April, but then falling away.

The young are carried in the pouch for a considerable time, and, on the average, are 22 weeks old before they leave the pouch. Occasional kittens are found right through to the early months of the following year. Though a proportion of the females carrying the kittens are late breeders, especially in the warmer districts, some breed twice in the one year.

The Family Group

Paired opossums are first seen in March and the single kittens are born near the end of April. The family group remains together until November or December, when the male drifts away, though he may remain in the vicinity. The kitten at this time is large enough to fend for itself, but it remains with the mother until the approach of the next breeding season.

Gestation and Birth

The genital organs and pouch of the female begin to enlarge at the end of March or the beginning of April, reaching maximum development in some 4 weeks when birth occurs. The young opossum, which is at first from ⅜ to ½in. long, crawls along a track of wet fur that the mother has licked from the genital opening to the pouch. At this early stage development of the hinder parts is only rudimentary, but the fore paws required for crawling are perfectly formed.

The manner of birth, which is common to marsupials, has been known for some 300 years, but in view of the widespread and still current belief that the young is born in the pouch after being passed through a teat, the following extract from field notes is quoted:—

> April 14, 1947, 10.25: Opossum seen in peculiar position in trap 39, line II. On closer inspection I observed a small kitten or new-born young, ⅜in. in length, approximately one third of the distance from the vulva to the pouch. Time to cover distance when first observed to lip of pouch: 7 minutes approximately. Opossum caught by hind leg, in sitting position on tail, leaning in ground fork of two trees. When kitten disappeared into pouch I left the vicinity of the trap and returned 1 hour 20 minutes later. After killing the female, I inspected the pouch and found kitten firmly attached to teat.
>
> When observing young crawling to the lip, a track was observed from the vulva to the lip of the pouch.

It should perhaps be stated that during the course of the investigation 74 genitals were taken containing embryos in all stages of development.

The kitten attaches itself to the teat, which it does not release voluntarily until some 6 weeks old, though the kitten is removed from the pouch before this by the mother when she cleans out the pouch. By the time it is a month old the young, if removed from the pouch, has little difficulty in returning, for though the eyes are not open, the nose is well formed and the sense of smell gives the necessary direction.

Opossums rarely produce twins and in such cases it is obvious that at a fairly early age one of the young must leave the pouch owing to lack of space. Attempts at hand rearing kittens slightly larger than a twin would be when forced to leave the pouch have failed, ostensibly because of exposure, though they have been kept indoors and provided with woollen covering. Direct evidence is difficult to obtain, but it appears unlikely that more than one offspring from the same birth can survive to maturity.

Development of Young

At the end of May the kitten has a body length of 2in., by the end of June it may be 3in., and during July the size varies from 3¼ to 4¼in. At this time the young are devoid of fur. During August the young are from 4½ to 5½in. long, the eyes open, and furring begins. During September the young grow to 6½ or 7in. and the coat becomes denser. In October, when the kitten is 8 to 9½in. and well protected by a soft silky fur, it leaves the pouch and rides on the back of the female. Though at this stage the young has commenced taking green feed and may be too big to re-enter the pouch, it is still suckled by the female. By the end of November the young is capable of fending for itself if necessary, but it continues to live with the female until the approach of the next breeding season.

Carrying of the young is mostly done by the female, but the male may carry late in the season, particularly when a second kitten has been born.

Opossums are nocturnal in habit and during the day conceal themselves in weatherproof nests or shelters in trees, hollow logs, holes in banks, and in tangled masses of vegetation such as kie kie or flax. High trees which carry a heavy load of creepers or perching plants are particularly favoured. Nests found in kie kie and flax are generally well formed and hidden, being hollowed out at the base of the vegetation. Some nests in flax were found with run-ins 3 to 4ft. long.

Opossums disturbed by dogs often find retreat in nests a short distance away. Several opossums are often found in one nest, as generally male, female, and kitten will be found living together for the greater part of the year. If the nest is not sufficiently large for the family, the male will nest separately nearby.

During bad weather there is practically no movement of opossums, but with continued rain and wind they are forced to come out and feed. This they do during lulls in the storm and when conditions deteriorate they retreat to their nests. There is some evidence that in windy and showery weather opossums travel little, limiting movement to the ground or to the lower levels of trees in sheltered positions.

Food and Damage

Investigation of food preferences has been carried out primarily to ascertain the economic status of the opossum in protection forests. Previous work on this aspect has been too fragmentary to permit the formulation of any authoritative opinion, so that though damage to orchards, gardens, and exotic plantations has been beyond dispute, there has been little unanimity in respect of effects on native bush.

The recent investigation made by the Wild Life Branch has shown conclusively that high populations in protection forest areas result in the progressive elimination of tree species in order of palatability and local losses of up to 70 per cent. of trees and shrubs have been recorded. The greatest damage appears to be done to high steep faces, which are unable to withstand attack for as long as normal bush.

The study has proceeded along three lines:—

1. Field observations.
2. Experimental feeding in captivity under approximately natural conditions.
3. Stomach collection for analysis of contents.

Field observation is the most important of these approaches because it alone can present anything like a complete picture of effects on forest or allow evaluation of ecological differences. By reason of its complexity, this form of investigation is the one most liable to suffer from errors or omissions, and data derived from both experimental feeding in confinement and stomach analysis are required to check the accuracy of tentative conclusions.

Experimental Feeding

The experimental feeding was conducted in a wire mesh cage 15ft. by 10ft. and 15ft. high, enclosing a typical section of the forest in the study area. No unnatural foods were given, but foliage, flowers, fruit, and bark from the surrounding bush were offered, while the selection of shrubs and ferns was augmented by limited plantings.

Stomachs were taken from trapped opossums, each being preserved in formalin and labelled to show the location and the date of capture. Microscopic analysis of the comminuted contents was carried out by the Botany Division of the Department of Scientific and Industrial Research. Upon receipt of a report from the Botany Division a further search was made in the vicinity of each trap for the presence of the plant species found in stomachs taken there. This gave evidence of distances travelled nightly and enabled food preferences to be assessed in terms of food availability.

Initially, progress in field investigation was slow, because density of vegetation obscured evidence of browsing and effects of opossums had to be separated from all other damage. An important advance was made when continued study of the remains of foliage partially eaten by captive opossums revealed a characteristic feeding pattern, or series of patterns, enabling the positive recognition of signs formerly overlooked.

This failure to recognise signs of destruction by opossums is usual, which accounts for the prevalence of reports of harmlessness in badly-affected areas containing many damaged trees. The main reason for failure (apart from inability) to recognise signs is that it is impossible for an observer to walk through bush looking constantly upward. Little detail above eye level is normally seen, because unless the gaze is directed at a steep angle, the lower shade foliage, which is unpalatable to opossums, obscures the tops. No significance is attached to dead trees, because they are found in all forests and evidence as to cause of death is soon obscured by time. Unless the species of dead trees are recorded, together with the incidence of dead, damaged, and untouched trees, obvious conclusions are missed.

Assessment of opossum damage in forest cannot be done simultaneously with other pursuits. Full attention is required, with a notebook and pencil as minimum equipment. For serious work both field glasses and climbing irons are required.

One form of defoliation which deviates from the normal pattern requires special mention: While there is preference for young leaves in general, this is very marked in some cases; for example, broadleaf, mahoe, totara, and kanuka. The effects produced on these trees are very likely to be overlooked, as often, owing to the small sizes of the parts eaten, damage tends to be spread evenly over a large part of a tree. There are no denuded twigs left to catch the eye and reduction of foliage does not occur to any marked extent for some time; it happens eventually through loss by the fall of old leaves exceeding gain by new growth. The resulting appearance is more characteristic of disease or age than of browsing.

Defoliation of trees can be caused by agents other than opossums, such as birds, rats, caterpillars, insects, disease, root damage, or wind. Generally the cause can be recognised, but sometimes the reasons for damage cannot be determined, particularly when the injury is old, so that affected leaves have dropped or trees have died. In these instances no responsibility has been attributed to the opossum in the findings described in this survey.

As food analysis records are too voluminous to permit adequate consideration here, present discussion will be confined to general principles.

In the experimental area, which carried only a moderate density of opossums, a wide, unmodified range of food plants was available without significant competition. Under these conditions, during the initial period of the experiment, the following result was obtained:—

FOOD TYPES AND PREFERRED SPECIES IN A BUSH AREA

FOOD TYPES

Foliage				Flowers	Seeds and fruit	Bark
Trees, shrubs, vines, etc.	Ferns	Herbs	Total species			
49	12	7	68	29	30	59

PREFERRED SPECIES *

Foliage

Konini
Rata
Titoki
Clover
Five-finger
Kamahi
Kohekohe
Tutu
Hinau
Wineberry
Broadleaf
Kanuka
Lacebark
Lawyer
Leatherwood
Totara
Rangiora
Toro
Maire (*black*)
Maire (*white*)
Maire (*Eugenia*)
Ngaio
Lancewood

Flowers

Rata
Clover

Seeds and fruit

Hinau
Kawakawa
Tutu
Pigeonwood
Konini
Tawa
Karaka
Miro
Totara
Titoki
Matai
Poroporo

Bark

Pigeonwood
Mahoe
Manuka
Kanuka
Heketara
Konini
Kawakawa
Horopito
Five-finger
Karaka
Putaputaweta
Maire (*black*)
Titoki
Rata
Mapou

* Species are listed in a rough order of preference. However, wide differences in choice occur in various districts. Even in one locality order could be changed significantly as the result of successive tallies, or of different methods of assessing priority, as, for example, frequency of occurrence opposed to proportion of diet.

EFFECTS OF BROWSING PRESSURE

[*Department of Internal Affairs photo.*

Konini, a preferred food tree, is frequently stripped of leaves.

Flowers and fruit rank high in preference, but leaves form the main part of the diet. Similarly, though the effects of destruction of flowers and fruit are serious, the critical factor, from the forest and soil conservation angle, is defoliation and loss of young shoots which cause the death of mature trees.

Bark biting is one of the most obvious of opossum signs. From the point of view of damage quite a number of species is affected, and trees sometimes die from this cause alone. Death from indirect causes is more common and, as happens sometimes with foliage depletion, it is usually the result of overshadowing by other trees, brought about by restricted growth due to the impaired vitality of the bitten trees. Incidence of bark biting is extremely variable, but it is generally least frequent in dry districts. From the observation of fresh signs it seems that bark is attacked during wet, windy weather, when movement of opossums is restricted.

Though no bark was reported as being found in stomachs, the amount freshly removed from trees appeared to be significantly greater than that found dropped or rejected. It is concluded that bark is a supplementary food taken in relatively-small amounts during wet weather. The absence of it in stomach contents is explained by its use being restricted to periods when weather conditions are adverse and when, because of limited movement by opossums, trapping returns are poor.

In most of the areas observed potential regeneration has been adequate; in others there is definite evidence that constant high opossum populations can prevent regeneration of bush.

During early stages of forest destruction full regeneration can be expected to continue only while adult trees and soil fertility remain. Moreover, actual regeneration falls far short of potential, and in the critical areas so far inspected browsing terrestrial animals do not permit the survival of seedlings of preferred species.

The reason for the frequent positive correlation between high population densities of opossums and purely ground-feeding animals is presumed to be the changed environment brought about by the latter animals. Removal of undergrowth and trampling promote circulation of air and drainage, resulting in lowering of humidity and rise of mean temperature. Further, the elimination of obstructions and the drying of a wet bush floor facilitate movement to preferred food trees and promote spread of population. Opossums usually breed once yearly in unfavourable districts, but twice a year in dry, warm country. Hence the presence of numerous deer, goats, or stock is likely to exert considerable influence on the opossum reproduction rate by tending to produce environmental conditions which favour the maximum breeding rate.

[*Public Works Department photo.*

Claw marks and bark biting on a mahoe tree.

These observations are made primarily from data recorded in the Orongorongo Valley, near Wellington, but that area is too limited for use as a basis for the formulation of general principles of opossum damage. Further evidence has been drawn from the Wellington district generally, from Poverty Bay, Mt. Egmont, and Stewart Island; in addition, general observations have been made incidental to other wild life work over much of the high country.

Orongorongo District

The Orongorongo district carries a moderate population of opossums. In the densest bush, where ground cover is heavy, few signs are evident, though careful searching reveals runways up occasional trunks and, in season, partially-eaten berries such as tawa or miro testify to the presence of opossums in the tops.

Opossums are much more numerous on more open country, ridges, higher basins, and valley floors, where many konini trees, prime favourite food species, may be found varying in condition from full vigour through successive grades of destruction to death. The konini, which is very tenacious of life, survives longer under heavy browsing pressure than less palatable species, but in many of the tributary valley heads, on steep faces, and in stream beds konini is being killed out. Trees which were marked by numbered tags and recorded as being in moderate condition at the start of the experimental year were found at its close to have declined. Some, with continued complete defoliation, had died.

Other preferred species, five-finger, titoki, etc., suffered much less, but individual trees were badly damaged or killed. This is due largely to the opossum's habit of concentrating upon special feeding trees which are stripped progressively while neighbouring ones of the same species are little touched.

Briefly, the selective feeding on foliage and fruit by opossums in their present numbers will eventually alter the composition of the bush in the Orongorongo Valley. The earliest consequence will be accelerated movement of scree with probably extensive slip development, due to the slow but cumulative destruction of the palatable tree and shrub species which cover the greater part of the most vulnerable terrain. In this work the opossum, which kills the mature tree, acts in concert with the goat that destroys the regeneration.

The southern Haurangi Range carries a denser population of opossums (and goats). The present browsing pressure varies with generally-widespread destruction of mature trees and there is no significant regeneration beyond the seedling stage. Konini, which was formerly plentiful, is virtually eliminated, while rata, five-finger, kamahi, and rangiora are following in the path of the first species. On the higher slopes cleared ground becomes occupied by the water fern *Histiopteris incisa*, which is only surface rooting and dies back during the winter, exposing bare soil. Slipping and consequent filling of the main valleys with shingle are already noticeable, though the actions of goats, pigs, and deer have contributed primarily to the shingle movement. Baring of ground by opossums is such a recent development that it has not contributed greatly to major soil movement, but a rapid spread of slip incidence can be expected.

Because the present distribution of the opossum in New Zealand is not known precisely, no comprehensive statement of economic loss can be made pending the completion of a Dominion-wide survey, but it is unlikely that subsequent work will entail any radical alteration in the general principles outlined here. The opossum, though now well established, has not reached any stability in population and numbers continue to increase generally. However, forest is long lived, so that even where high population density has been reached the destructive cumulative effects do not become apparent for some time.

All country cannot support large numbers of opossums, but sporadic centres of high density may be found, as, for example, in isolated patches of coastal bush where kohekohe and ngaio are attacked.

On cultivated land the range of crops, trees, vegetables, and flowers eaten is too wide for full enumeration, but a brief selection for each of the main plant types attacked is as follows:—

Exotic trees: Willows, pines, eucalyptus, poplars, oak, Douglas fir.

Fruit species: Apple, peach, plum, pear, lemon, passion fruit.

Vegetables: Parsnip, carrot, beans, silver beet, cabbage, lettuce.

Flowers: Rose, polyanthus, carnation, cyclamen, gladiolus, godetia.

Crops: Maize, rape, swedes, potatoes, peas, mangolds.

Serious Pest in Poverty Bay

Poverty Bay differs from country already considered, as bush there tends rather to scattered groups than to continuous forest, with scrub and flax more prominent. Accelerated erosion is already a recognised problem in Poverty Bay. The opossum has become an economic factor in two main respects: It destroys trees and cuttings required for soil conservation purposes, and it damages crops. The Poverty Bay Catchment Board contends that the opossum "has become pest No. 1 in this district."

PLANTS MENTIONED IN TEXT

Maori Name	Scientific Name	English Name
Heketara	*Olearia rani*	tree daisy
Hinau	*Elaeocarpus dentatus*	
Horoeka	*Pseudopanax crassifolium*	lancewood
Horopito	*Wintera axillaris*	
Kamahi	*Weinmannia racemosa*	
Kanuka	*Leptospermum ericoides*	white tea tree
Karaka	*Corynocarpus laevigata*	
Kawakawa	*Macropiper excelsum*	pepper tree
Kohekohe	*Dysoxylum spectabile*	N.Z. cedar
Konini	*Fuchsia excorticata*	tree fuchsia
Mahoe	*Melicytus ramiflorus*	whiteywood
Maire	*Olea lanceolata*	white maire
Maire-raunui	*Olea cunninghamii*	black maire
Maire-tawake	*Eugenia maire*	
Makomako	*Aristotelia serrata*	wineberry
Manuka	*Leptospermum scoparium*	red tea tree
Mapou	*Suttonia australis*	red maple
Matai	*Podocarpus spicatus*	black pine
Miro	*Podocarpus ferrugineus*	broadleaf
Ngaio	*Myoporum laetum*	
Papaumu	*Griselina littoralis*	
Porokaiwhiri	*Hedycarya arborea*	pigeonwood
Poroporo	*Solanum aviculare*	
Putaputaweta	*Carpodetus serratus*	
Rangiora	*Brachyglottis repanda*	bullibull
Rata	*Metrosideros robusta*	white back
Tataramoa	*Rubus australis*	northern rata
Tawa	*Beilschmiedia tawa*	lawyer
Titoki	*Alectryon excelsum*	
Totara	*Podocarpus totara*	
	Podocarpus hallii	
Tutu	*Coriaria arborea*	
Whauwhaupaku	*Nothopanax arboreum*	five-finger
	Trifolium repens	clover
Houhere	*Hoheria sextylosa*	lacebark
	Hoheria angustifolia	
	Senecio eleagnifolius	leatherwood

Opossums and Birds

While direct interference with birds of importance to forest welfare has not been observed, it is obvious that large populations of opossums have some effect on birds living in the same bush habitat.

Dr. R. A. Falla, Director, Dominion Museum, was asked to comment as to the likely effects on native birds from the ascertained damage to forest vegetation, which includes the killing by defoliation of many flower- and berry-bearing trees and the destruction of green and ripe fruits in large quantities. Dr. Falla gave this opinion:—

> I would say that in general it represents a serious dislocation of bird economy and must impose critical restrictions on their normal food and cover requirements. From the information supplied, the following birds are certain to be affected, in the following ways, at definite periods:—
>
> 1. **Pigeons** would be deprived of a proportion of seasonal fruits on which they depend, in particular konini and poroporo (January); tawa, titoki, maire (March, April); miro and hinau (May, June).
> 2. **Tuis** must be adversely affected by shortage of seasonal nectar in konini (October-November) and rata (January-April), of leaf-eating aphides, particularly on wineberry (February), and of a wide range of berries of several trees (e.g. konini) from midsummer on.
> 3. The **bellbird** may be considered as similarly affected, but it appears to have a wider range of alternative food, especially in beech forest.
> 4. **Kakas,** which are among the least adaptable of native birds, would be most directly affected by any serious reduction of rata flowers.
>
> While the above cases are specific, they do not include all the birds likely to be affected. Many insectivorous birds will be deprived of some of their main food by defoliation. Another effect of removal of certain rain-turning and canopy leaves like rangiora is a reduction of safe sites for the nesting of fantails, which cannot nest in thickets.
>
> To the indirect effect on birds of damage by opossums must be added the possibility that New Zealand bush birds generally must now have a very restricted range of roosting and nesting sites that are safe from nocturnal disturbance by an animal which in light forest and undergrowth is relatively clumsy.

The activities of trappers themselves on bird life must be considered too. While the destruction of rats, cats, stoats, and ferrets accidentally trapped is advantageous to birds, prevention of accidental trapping of the kiwi and weka requires the use of punga run sets at a fairly-steep angle. Where these birds are not present in numbers warranting the use of this type of set, "fencing" by placing stones or sticks round the trap may save birds by restricting approach to the trap.

Varietal Characteristics of Pip Fruits

By T. CONWAY,
Orchard Instructor, Department of Agriculture, Hastings.

[Ministry of Works photo.

QUALITY, appearance, and ability to withstand transport and storage are usually considered the measure of the merit of any variety of apple or pear for commercial purposes, and those points should be considered when a grower is selecting varieties for orchard planting. Under certain circumstances, however, one or more of those desirable features must be overlooked to select varieties which not only spread the harvesting period for the grower but also supply a public need.

FOR example, first early apple varieties such as Irish Peach and Beauty of Bath have no storage life and are of somewhat inferior quality. Mid-season varieties such as Gravenstein, Cox's Orange, and Kidd's Orange Red have satisfactory appearance, quality, and transit capacity, but their storage life is very limited. The late varieties such as Sturmer, Delicious, Dougherty, and Granny Smith usually have good quality, storage, and transit features, which make them very desirable and profitable for main crops.

Broader characteristics such as colour classification, length of stem, and susceptibility to diseases and pests and to premature dropping or physiological disorders must also be given detailed attention before and during harvesting. No variety of apple or pear is perfect in every respect, and therefore each variety must be accepted on its merits, and safeguards taken in general orchard practices against any varietal weaknesses.

Following are comments on the more popular varieties of apples and pears, given in alphabetical order:—

APPLES

Ballarat

The Ballarat variety is noted for its regular and heavy cropping and the large average size of the fruit. It can be harvested over a fairly long period, from mid-February to end of April, and an early light picking of only the largest fruit allows the remainder to reach a very satisfactory size and tends to increase the bulk of fruit harvested in any one season. If Ballarat apples are picked toward complete maturity, the fruit becomes very greasy, sometimes causing grading machines to become dirty or dust and dirt to adhere to the fruit. By careful judgment of the final harvesting period difficulty in this respect can be avoided, especially if the fruit is immediately graded and packed on receipt at the packing shed. When this variety is left in the orchard or packing shed for long periods after being harvested the appearance is sometimes spoilt by a deposit of dust adhering to the greasy skin. If the fruit is intended for cool storage, a delay of 10 days is advisable between picking and storage to avoid discoloration of the skin.

All forms of plant life show a wide range of characteristics distinctive of specific varieties, which play an important part, for good or bad, in the commercial value of most botanical varieties of plants. Apples and pears, as well as other kinds of fruit, exhibit this factor to such an extent that it is important for fruit growers to give special consideration to the known characteristics of the present leading commercial varieties of apples and pears which need careful consideration by growers before and during harvesting. This information should be of particular interest to newcomers to the industry, such as ex-servicemen settled under rehabilitation, many of whom have yet much experience to gain of smaller but important details of fruit production.

The large size of the fruit reduces harvesting and packing costs, as it is quick to handle. Except for a tendency in some districts to early and late infections of black spot, it is a very sound and reliable culinary variety. The Ballarat is also subject to glassy core, but that is considered only a minor fault, and the incidence varies with the climatic conditions.

Cleopatra

Some varieties are more prone to alternate seasonal bearing than others, and Cleopatra comes within that category to some extent. It also appears to react unfavourably to extremes of climate, and during seasons of light crop the fruit tends to develop certain weaknesses. This variety is susceptible to bitter pit, calyx cracking, and mouldy core. Unfortunately, little can be done to avoid those faults when conditions are favourable for their development, but extra care is necessary at the time of harvesting and packing to prevent faulty fruit from reaching the market.

This variety is usually harvested from the first week in March to the third week in April.

Cox's Orange

Cox's Orange apples normally are harvested from mid-February to the end of March, though the time of starting sometimes varies with the

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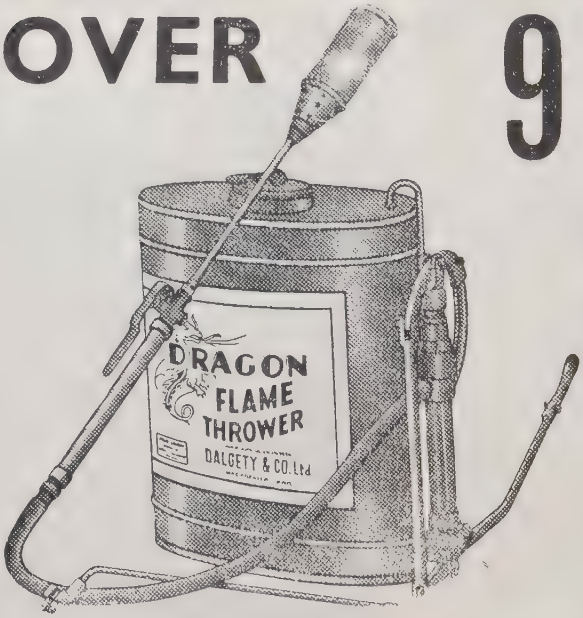

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seasonal conditions. The variety tends toward alternate-year bearing, and when dry conditions coincide with a heavy crop the fruit is rather small unless it is thinned fairly heavily. If the crop is light, pickings are made too early, or harvestings are taken from young trees, the fruit is likely to be subject to bitter pit. Under such conditions, too, the life of the fruit after harvesting is very short and it soon becomes mealy and soft. Special care is therefore necessary in such circumstances to assure the fruit being marketed in sound condition.

The Cox's Orange variety is also subject to severe cracking at the stem end of the fruit, from which it suffers more in some seasons than in others. If these cracks are deep and fresh at the time of harvesting, the fruit is likely to rot rapidly at the cracked areas and considerable care is necessary at the time of grading to eliminate fruit likely to deteriorate quickly.

This variety is considered one of the best quality of the dessert type grown and is particularly suitable for export because of its popularity on the English market.

Delicious

The Delicious variety is recognised as one of the leading commercial dessert apples throughout New Zealand, and the fact that it keeps well in cool storage and supplies a coloured variety late into the season increases its marketing value.

It is a fairly regular and often a heavy cropper, but is subject to black spot and heavy infestations of red mite. It is also subject to mouldy core in the Auckland district and to a less extent in most other districts. The very open calyx opening not only exposes it to mouldy core infection but also aggravates its susceptibility to codling moth infection. When mouldy core is prevalent it is advisable to delay the first picking until a natural or premature dropping of much of the affected fruit occurs, preventing it from reaching the packing shed. Once it reaches the packing shed affected fruit is difficult to isolate by outward appearance by anyone without considerable experience.

The Delicious variety is usually harvested between the first week in March and the third week in April, but during dry weather or when red mite is prevalent on the foliage the typical colouring of this variety is retarded. The colouring is considerably improved by rain or a succession of heavy dews and cool nights. It is advisable to restrict the first picking to the fruit at the tops and more exposed parts of the trees, where the colour is usually more advanced. The balance of the fruit will then improve in both size and colour for later pickings. Fruit intended for cool storage should be packed and stored immediately after being harvested to obtain the best results. If fruit in forward maturity is cool stored, it will become mealy and of poor quality.

Dougherty

Also classified as a late-keeping coloured variety, the Dougherty apple maintains an important place among commercial varieties. It is somewhat irregular in cropping, but if the fruit is thinned heavily each year, reasonably stable cropping can be greatly assisted. Thinning is also necessary to assure satisfactory size of fruit, as the variety tends to be small unless that work is carried out efficiently.

The fruit is harvested from the third week in April to the second week in May, and it holds well in cool storage if not picked beyond the best stage of maturity for storage. It is rather subject to bitter rot (*Glomerella cingulata*) and black spot, and in some districts pre-harvest sprays of weak Bordeaux solutions are necessary as a precaution against those diseases becoming troublesome just before or after harvesting. This variety also tends to develop eye rot just before being harvested, when conditions are favourable for its development.

Golden Delicious

Introduced in more recent years, Golden Delicious, because of its fine dessert qualities, is fast becoming a popular favourite with the consuming public. It is golden yellow when ready for eating and is harvested from about the second week in March to the last week in April. The stems are long and the fruit tends to be carried on the trees in loose clusters, though the clusters are well spread through the trees. It is usually a consistent cropper and the tree is a relatively strong grower.

The fruit has a tendency to slight mouldy core, and bitter pit is likely to develop in large fruit picked too early when crops are light or from young trees. Care must be taken to harvest this variety at its best maturity stage for marketing and storage or the fine edible quality may be adversely affected. On the other hand, the fruit should not be left on the trees too long or ripe spot is likely to develop, and in this respect the variety is similar to the Sturmer. Large fruit should not be cool stored.

As this variety is rather soft and crisp in texture, ample protection should be afforded the fruit by care in handling and the use of ample wrapping paper and all-round corrugated liners in the cases. The added care and protection will assure the fruit being marketed in good condition and avoid the severe bruising to which the variety is subject if badly handled.

Granny Smith

The Granny Smith variety has proved itself a sound general-purpose apple. It is a good, regular cropper and relatively easy to produce and handle. The fruit is usually of good size and simple to grade and pack. When trees reach maturity, however, some difficulty is experienced in maintaining steady growth with the stocks at present in use.

This variety is harvested from the first week in April to the first week in May, and because of its susceptibility to superficial scald under cool-storage conditions the fruit should be packed in oil wraps and packing delayed for ten days after harvesting. Fruit of this variety intended for cool storage should be picked before there is much change in the background colour but late enough for reasonable maturity to have developed. Fruit from young trees should not be placed in cool storage, as it will not hold satisfactorily.

Gravenstein

Unfortunately few really sound varieties of early dessert apples are grown in New Zealand, and for that reason growers have tended to curtail their production of early fruit. That is an unfortunate trend, and continuity of supply is upset. However, the Gravenstein is recognised as the soundest early dessert variety, and as it is harvested from about the second week in January to the end of February, and is usually a good and regular cropper of high-quality fruit, it plays an important part in production and marketing.

It is a short-stemmed variety and the fruit is usually carried in rather tight clusters. Unless carefully thinned the fruit is likely to fall from clusters during the final sizing before harvest. During recent years many growers have found hormone cling sprays beneficial in overcoming the tendency of the fruit to fall prematurely, and their use is becoming a routine procedure.

Large fruit harvested too early during light crops or from young trees will quickly develop bitter pit if held for even a short time, and immature fruit is of poor quality and likely to spoil the market reputation of this variety. Because of the shortage of apples during January growers are often tempted to harvest the first Gravensteins too early, and that is a short-sighted policy if the reputation of the variety is to be maintained.

The Gravenstein tree has one serious weakness—the progressive effects of gnarling or cell collapse of the main limbs and branches. There is evidence to suggest that this physiological trouble may be caused by the present stocks used, and possibly it may be corrected by working the variety on to its own roots. This disease tends to shorten the economic life of the tree; though cropping is usually maintained, the fruit becomes progressively smaller as the disease weakens the whole tree.

This variety is occasionally affected with mouldy core, and where this is known to be present any odd fruits showing early maturity and high colour should be treated as suspect.

Jonathan

Among the coloured varieties of apples in production in New Zealand the Jonathan has maintained an important place for many years. Its harvesting period is from the first week in March to the third week in April, and it is generally recognised as a steady and heavy cropper. The tree is not a strong grower, and it has a spreading habit unless corrected by careful pruning.

This variety has been abused in recent years by the tendency of growers to pick it early to assure its cool-storage capacity and prevent wastage from premature dropping. For immediate marketing the Jonathan should be picked at a stage of forward tree maturity, when its edible quality has fully developed. Its market value is then considerably enhanced, and the public demand would greatly increase if this practice were followed. By the application of hormone cling sprays before harvesting the tendency toward premature dropping can be overcome.

It is usual to confine the first picking to the higher and more exposed fruit, which is more forward in colouring. The remainder will then rapidly improve in colour and size for subsequent picking.

Large Jonathan apples are not suitable for cool storage, and no time should be lost in placing the more suitable sizes in cool store after harvesting. If the temperature at which this variety is held is too low, or the fruit is too forward in maturity, it is likely to develop soft scald and flesh collapse. The Jonathan apple requires a little more consideration in general handling than many other varieties.

LOADING APPLES AT PICTON

[*National Publicity Studios photo.*

APPLES are the main fruit grown in New Zealand, accounting for about 9000 acres of a total of more than 16,300 acres in commercial orchards. Of the total area devoted to the growing of apples more than 3500 acres are in the Nelson district, of which 2517 acres are in the Moutere Hills.

In the years 1934-40 a yearly average of 1,056,336 bushels, valued at £522,160, was exported from New Zealand, but export was interrupted during the war because of the shortage of suitable shipping. In the early post-war period export was started again on a small scale and last year almost 1,000,000 bushel cases were shipped overseas.

Though Port Nelson is capable of accommodating vessels up to 11,000 tons, much of the export produce from the Nelson district is loaded on to coastal steamer or scow (as illustrated above) at the feeder ports of Picton, Motueka, and Mapua and taken to Wellington where it is transhipped to overseas vessels.

Kidd's Orange Red

On the evidence at present available the Kidd's Orange Red variety appears to have proved more successful in some districts than in others. For instance, it has been very satisfactory in Hawke's Bay, where further plantings are being made or are contemplated. Fairly severe russeting has been a problem in some districts, but there is a relative freedom from this under Hawke's Bay conditions.

The variety matures about the same time as Cox's Orange, being harvested from about the middle of February to the end of March. It is a regular and heavy cropper, and the fruit usually attains a very satisfactory size. The tree grows strongly and is easily handled. The fruit is of first-class dessert quality and is in good demand in the markets.

It is a short-season variety unsuitable for long storage, and extra care is necessary to expedite harvesting and packing when the fruit has reached reasonable maturity, as it tends to become soft and mealy if any undue delay occurs at that stage. Every effort should be made to assure this variety reaching the market in the best possible condition, and to do so growers need to divide their attentions between the Kidd's Orange Red and Cox's Orange varieties where both are grown.

Lord Wolseley

A culinary variety, Lord Wolseley has been grown fairly extensively in Canterbury but to a less extent in the other main fruit-growing districts. It tends toward alternate bearing but is otherwise a heavy cropper. The fruit is usually of good size and first-class cooking quality. Harvesting usually begins in mid-February and continues until the end of March, and it is necessary to see that the fruit is mature and that it is wrapped in oil wraps for cool storage. Immediate storage after harvesting and packing is essential to maintain the fruit in good condition.

This variety tends to develop bitter pit and glassy core, and when the fruit which has been stored is exposed to strong light or sun in shop windows considerable discoloration of the skin occurs.

Red Astrachan

Though the quality of Red Astrachan leaves much to be desired, it is an early variety on which the public has to rely from the end of December and during most of January for dessert purposes, and to some extent for cooking. The tree is a strong grower, but the crops are not only rather erratic but also seldom heavy. That is generally applicable to the first early varieties, and though the Red Astrachan has its faults, it fills an important role in assisting continuity of supply.

The fruit is of medium size and usually of reasonably good colour. It is rather subject to black spot and quickly becomes affected with codling moth if sprays are neglected. Probably its worst features are maturing and colouring very irregularly and liability to drop freely as it approaches maturity. Frequent picking has therefore been necessary in the past to avoid wastage and assure suitable maturity and colour. That factor has been largely overcome during the past two years by the application of one or two hormone cling sprays before the usual harvesting period, which has proved very effective in lessening wastage and number of pickings, but care needs to be exercised to avoid any of the fruit becoming over-mature and mealy.

Rome Beauty

The Rome Beauty variety has performed well under almost all conditions throughout New Zealand. Closely-related varieties are the Frimley Beauty and the Glengyle Red. The Rome Beauty is a late-keeping variety and the fruit usually reaches a very satisfactory size. The harvesting period is from the beginning to the end of April.

The tree is not a robust grower and has the natural habit of bearing its fruit on the ends of light laterals, which bend over with the weight of fruit, causing the tree to develop a somewhat drooping formation. The first picking is confined to the larger and more exposed fruit which have become well coloured, and that assists the remainder of the fruit to improve considerably in size and colour.

It is rather subject to superficial scald in storage, and harvesting at the correct stage is therefore important. It is also somewhat susceptible to glassy core and eye rot when conditions are favourable for these to occur.

Statesman

Though very subject to alternate season bearing, during the "on" seasons Statesman carries heavy crops. The fruit is white fleshed, of good eating quality, and of good shape and appearance, though usually of medium size. The harvesting period is from the beginning to the end of April.

It is not a good variety for long cool storage, but short storage is possible under orchard or cool-store conditions if the fruit is kept under close observation for deterioration. This variety is susceptible to black spot infection, and very prone to fungal rotting in storage.

Sturmer

There is a limited number of apple varieties grown in New Zealand for many years which, because of their outstanding attributes, have become accepted as essential to the sound financial status of most orchardists. Without doubt the Sturmer is of the first importance in this category. Its capacity for heavy and consistent bearing and its excellent cool-storage quality make it a very desirable variety in any orchard.

Sturmer apples are usually harvested from the first week in April to the first week in May, and usually one or at most two pickings suffice. The fruit is of good average to large size, and the size is not affected by dry conditions, as is usually the case with the other varieties. In fact this variety appears to thrive under dry conditions, as was evident during recent dry years.

Because of its heavy cropping the tree is not a vigorous type, and it develops fruit spurs very freely. The spurs require a special thinning out process at the time of pruning; apart from other advantages, that saves much added thinning of the fruit. For best cool-storage condition it is advisable to complete harvesting before any mellowness of the fruit is apparent. As this variety is very susceptible to bruising and skin abrasions during and after picking, it is very important to delay the grading and packing until five to ten days after harvesting to give the skin an opportunity to toughen and the flesh to become firmer.

The Sturmer is very subject to russeting in some districts, but as that has become accepted as almost a characteristic of the Sturmer, generous allowances are made in the grading standards for this variety. During long periods of high temperatures sun scald can also be quite severe. Infections of ripe spot and bitter rot sometimes occur late in the harvesting season, and applications of weak Bordeaux sprays as a control are a standard practice in some districts during the late summer. Corky pit has also been a problem in some districts, particularly Nelson, where boron has been deficient in the soils; that has been corrected by the application of boron to the soil where necessary.

PEARS

The correct harvesting period of pears cannot be judged by the same external standards as for apples. If pears are left on the trees until a significant colour change occurs—until they are fully tree ripened but firm—the quality is inferior to that of fruit harvested on approach to maturity and later ripened at ordinary shed or room temperature and fairly high humidity. The flavour and aroma of the earlier-picked fruit is far superior and the eating quality of each variety is developed to its fullest extent.

The first sign of maturity is the ease with which the fruit of any variety becomes detached from the tree when lifted upward during picking. The most favourable size for each variety is a factor needing close scrutiny, as is the normal harvesting period. If a change in colour of the fruit is noticed when the maturity of a variety is being checked, it should be obvious that harvesting should not be delayed and the need for immediate marketing should be considered.

The change of colour and of skin texture is so slight at the correct picking stage that it is a guide only to a man with considerable experience, but the orchardist should endeavour to become familiar with these signs, though it might be too much to expect the average semi-skilled employee to recognise them. There is a significant change in the flesh texture and juice or sugar content on approach of maturity, and that should also be noted by the orchardist when maturity is being considered.

If pears are picked too early, or dry conditions precede harvesting, the fruit will have a distinct tendency to wilt. Fruit for long storage should reach the cool chamber immediately after being picked.

Beurre Bosc

Usually harvested from the last week in February to the third week in March, the Beurre Bosc variety is usually a regular cropper and a reasonably satisfactory cool-store variety. It is a long-stemmed pear, which at times tends to drop prematurely; that can be corrected by the careful use of hormone cling sprays. It is not particularly attractive and is rather gritty in texture, but it has reasonably good eating quality. As with most pears, it is fairly susceptible to black spot.

Beurre Clairgeau

Though of only medium quality, the Beurre Clairgeau variety has other features which add to its commercial value. It usually attains large size and has a clear, smooth skin texture, generally developing a deep blush on one side. It is somewhat irregular in cropping, however, and is not considered a good cool-store variety. The harvesting period is from the second week in February to the third week in March.

Conference

The Conference pear, which is harvested from the third week in February to the second week in March, is usually a good cropper. The fruit is long and tapering but its eating quality is good. Apart from the fact that the fruit occasionally tends to be small and to drop prematurely, it is also subject to russeting and, because of its shape, is difficult to pack. Though a good-quality pear, its disadvantages have made it lose some of its popularity.

Doyenne du Comice

Generally recognised as the best-quality pear at present in production in the Dominion, Doyenne du Comice is of very smooth and juicy flesh texture when properly ripened and has a particularly attractive and delicate flavour. The fruit is usually large and short stemmed, and the skin, as well as being smooth and clear, often carries a considerable area of pale blush.

This variety seldom crops heavily and often irregularly. The harvesting period is from the third week in February to the third week in March. Care needs to be exercised in its harvesting, as prematurely-picked fruit does not ripen satisfactorily and over-mature fruit has a short life. If picked at the correct stage of maturity, the fruit slowly ripens to perfection.

During handling and packing this pear requires more care and protection than most others because its thin and delicate skin is subject to abrasions, stem punctures, and general damage. Branch rub is also rather prevalent.

Louise Bonne de Jersey

Ready for harvesting from the second week in February to the second week in March, the Louise Bonne de Jersey pear is a regular and heavy cropper. It is an attractive clear-green fruit of good eating quality and medium size. This variety is grown on both pear and quince stock in Hawke's Bay, but the pear stock has proved superior and it is considered that any new plantings should be on that stock.

It is most important that the harvesting of this pear should be completed before forward maturity is reached, as it is difficult to market forward-maturity fruit before it collapses. If risks are taken in this respect, much damage can be done to this pear, which otherwise has a good reputation among commercial growers and consumers. Possibly its only disadvantage is its failure to size satisfactorily when conditions are very dry. Selective pickings measurably assist the over-all sizing of the crop.

P. Barry

Among the late-keeping varieties of pears P. Barry continues to maintain a fairly important place. That may be rather surprising in view of its very poor eating quality, but it has other attributes which tend to offset that deficiency. Apart from its excellent storage quality, it is usually a good cropper. The fruit is of large size and there is no immediate necessity to pack it after harvesting, as it holds well in ordinary shed storage.

This variety is rather subject to black spot and often tends to drop prematurely, particularly in windy weather. Good control of premature dropping has been obtained recently by the application of two hormone cling sprays before the normal harvesting period, which usually extends from the second week in March to the last week in April.

Packhams Triumph

The Packhams Triumph variety is likely to be grown more widely in the future because of its quality and its capacity for regular cropping of good-sized fruit. As it is similar to Williams Bon Chretien in many respects, its harvesting period, extending from the third week in February to the last week in March, is an important factor.

There is a sound demand from private consumers for bottling purposes, particularly from those who have neglected to procure supplies of Williams Bon Chretien or wish to continue bottling after the latter variety is finished. The fruit develops a pinkish tint when bottled or canned.

Fruit harvested from young trees tends to have a rather rough or irregular surface, though the skin is a clear pale green. However, the general appearance of the fruit improves considerably as the trees become older. It is a good dessert variety and holds reasonably well in cool storage. It does not appear to have any special weaknesses, and growers find it a good all-round variety to produce and handle.

Williams Bon Chretien

Without doubt Williams Bon Chretien is one of the outstanding pears grown in New Zealand. It has many good features, not the least of which is its excellent canning or bottling quality, and as a dessert variety it has few equals. Another advantage is its comparative earliness, and though it has a short season and is unsatisfactory for cool storage, there is always a ready market for it for canning, bottling, or dessert. Almost all pears canned commercially are Williams Bon Chretien. Harvesting usually begins during the second week in January and ends in the last week of February, and the first pick should be confined to the largest fruits in the tops of the trees.

It is important that this variety be picked while the fruit is very firm and green. The natural process of ripening continues gradually after harvesting and packing, and the best edible quality is then obtained. When fruit is harvested at forward maturity it lacks flavour and texture and is likely to collapse rapidly.

This variety is subject to fireblight and black spot, and every care is necessary to prevent infection by codling moth.

Winter Cole

Ranking as one of the most important late storage pears produced in New Zealand, the Winter Cole variety is relied on to maintain the supply of dessert pears late in the season more than any other variety. In the main pear-growing districts it has proved very satisfactory to produce and handle.

It is usually harvested between the first week in March and the first week in April and is a fairly consistent and often heavy cropper. The eating quality is first class and it is generally popular with the consuming public. It is somewhat subject to black spot and very liable to become marked with branch rub in windy weather. Heavy thinning of the fruit is essential during seasons of heavy crops, and unless that is given careful attention average fruit size is likely to be small. Dry conditions also seriously restrict fruit size, and much tedious harvesting and packing work may be involved in such circumstances. The need for strict attention to thinning cannot be overstressed.

Care must also be taken to ensure that fruit intended for cool storage should not be of forward maturity, as such fruit ripens early in storage and quickly develops fungal rots. On the other hand, fruit picked too early wilts considerably in storage. To prevent the spread of fungal rots the use of copper sulphate-impregnated wrapping paper on this variety is a standard procedure for all cool-storage fruit. Furthermore, fruit intended for late storage should be placed in the cool chamber not more than 48 hours after being harvested. Any delay in handling during this period has a serious effect on the possible length of storage.

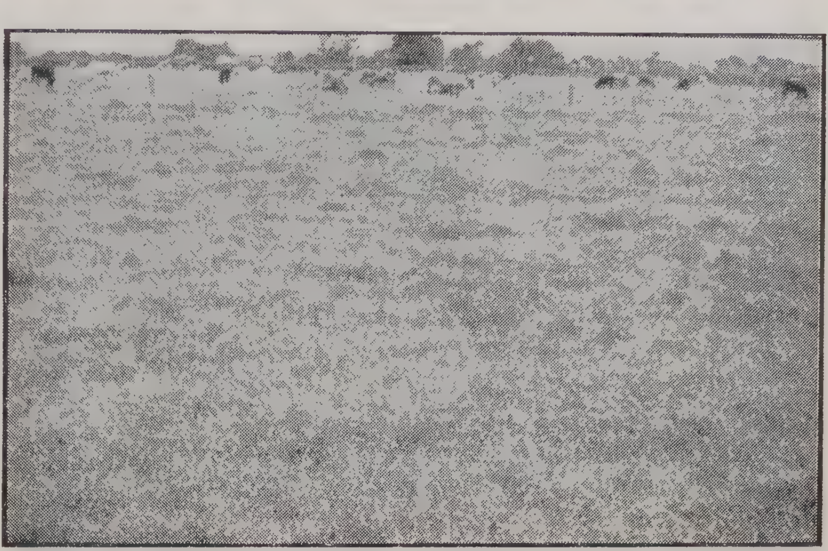
Winter Nelis

In many respects the Winter Nelis pear resembles the Winter Cole. Its harvesting period is a little later, beginning during the third week in March and continuing until the last week in April. This variety is somewhat irregular in cropping, but the fruit is often a little larger than the Winter Cole. It is very subject to black spot and particularly susceptible to mealy bug infection. Its cool-storage quality is somewhat superior to that of Winter Cole, and in general it requires to be handled for cool-storage purposes in the same way as is recommended for Winter Cole.

Management of Poaching Soils

By C. WALKER, Assistant Fields Superintendent, Department of Agriculture, Palmerston North.

IN various parts of New Zealand the heavier and more fertile soils, because of fairly-high rainfall, are subject to severe poaching during the wetter months. This is particularly the case during late winter and early spring, when the soils are normally well saturated with rainwater and appear incapable of discharging it at a sufficiently-rapid rate by normal means to maintain solidity near the surface.



A general view taken in early spring on a farm where rolling is done regularly.

SOILS that fall into this category are the various marine silts, the heavier meadow soils, and the stiffer clay loams, all of which absorb water freely and have the power to retain considerable quantities, but do not possess those desirable features of drainage which enable other and lighter soils to discharge such surplus water. In districts of relatively-high rainfall where these soils occur it is not uncommon to find them poaching very severely.

Poaching is a problem which is sufficiently widespread to warrant consideration not only of the causes, but also of the remedies. Each year quite large areas of good pasture in parts of North Auckland, on the Hauraki Plains, in parts of Manawatu, and in Southland are badly mutilated by stock during periods when the land is excessively wet.

Drainage the First Requirement

Any reduction in the tendency of soils to break up badly under stocking is dependent almost entirely on the removal of sufficient water to enable the soil to remain firm enough to carry stock. This can be achieved by a suitable drainage system and drainage alone can do more in this respect than any other method or combination of methods which might be advanced as a means of overcoming the problem. To reduce soil soaking to a minimum it is of paramount importance that water should be disposed of as rapidly as possible after its precipitation as rain.

Part of a poached field showing water lying in hoof marks where neither wind nor sun can get at it to dry out the soil.

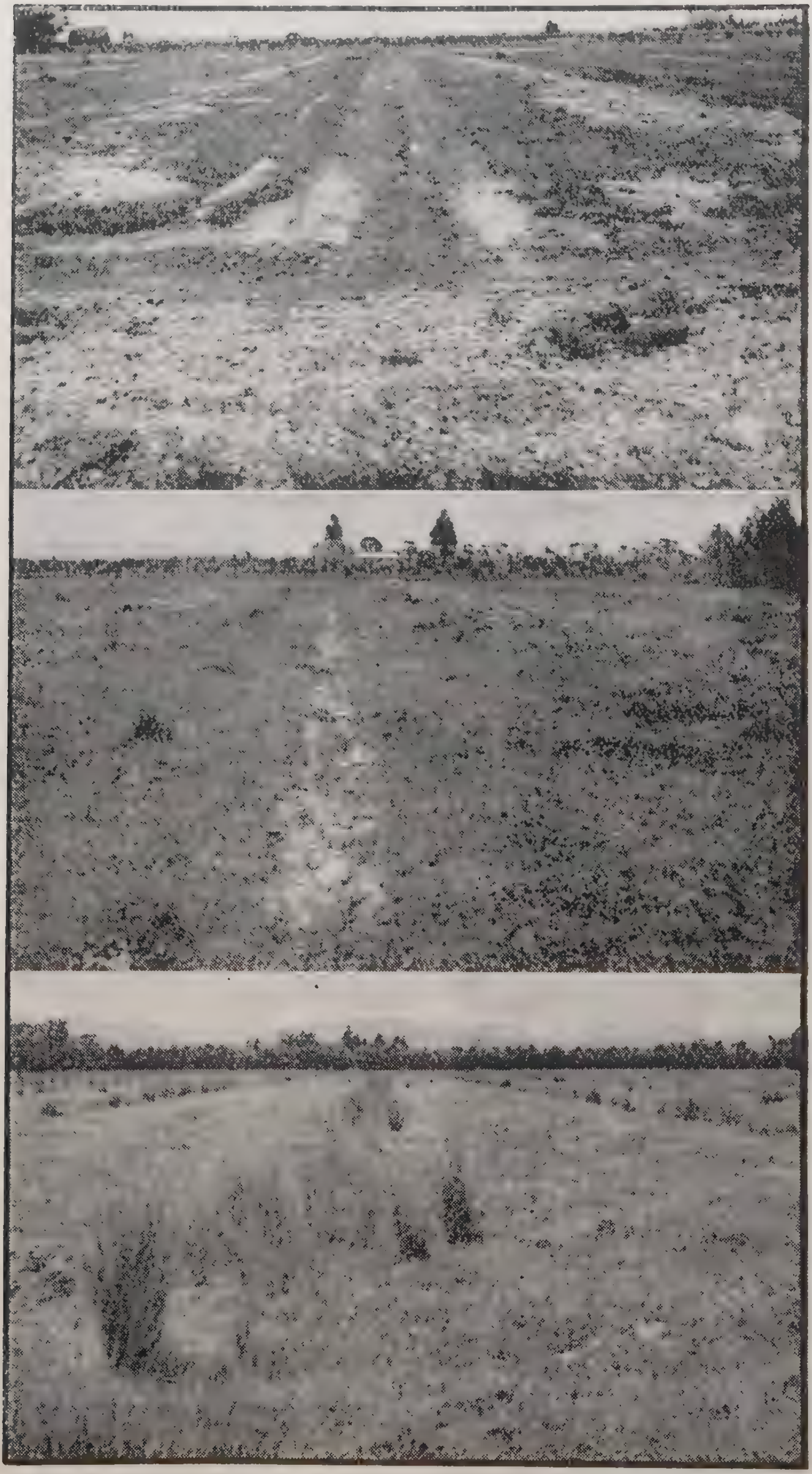
Drainage, then, should be the first consideration.

Drains may be of several types to suit varying soils and conditions. In the main good underground systems of tile or mole drains, or a combination of both, will be more efficient on heavy soils which poach than will the open type of drain. The advantages may be summarised as follows:—

1. They provide more efficient draw-off of surplus water.
2. They do not interfere with cropping, cultivation, or stock movement.
3. They do not require double fencing and so do not provide a haven for weeds and pests.
4. Valuable land is not taken out of production.
5. Annual maintenance by cleaning, etc., is eliminated.

Considerable areas of Manawatu and Southland country have been greatly improved by underground drainage systems and it is fair to assume that even greater production could be expected from an intensification of this work on the same country.

Despite the decided advantages of enclosed drains, it is not possible to dispense entirely with open systems. They are necessary usually as main drains for conveying the discharge from tile or mole drains, or they may be required as alternatives to these closed drains on country that is quite unsuited for the latter. Thus on the marine silts mole drains have an extremely short life and tiles tend to silt up within a year or so, so that the open drain is of first importance in removing surplus water. Because their sphere of influence will not extend very deeply into the fields, open drains should be placed so that they can receive minor feeder drains at short intervals.



Upper—Grading in channels on flat land. The earth is graded back to the mid-line of lands to provide a watershed. Middle—In the first year after disturbing the soil buttercup and similar weeds develop. Lower—Two or three years after grading in channels these frequently fill with rushes.

In general the feeder drains within fields should not be very deep, nor should they be steep sided. Many areas are adequately served by gently-graded depressions not more than 9in. deep and about 4 to 6ft. wide at the top. Such channels grass over and do not impede the movement of implements.

Where steps have been taken to remedy any drainage problems that might be assisting poaching it can be expected that a material improvement will take place in the ability of the soil to withstand normal winter stocking. Nevertheless, even with the best of drainage, soils will tend to cut up under conditions of excessive rainfall and winter stocking. What, then, are the additional remedies?

Discing and Reseeding

Land that still poaches will dry out with an extremely rough surface and a broken turf which will permit weeds to establish. The rough surface will be difficult to stock and extremely damaging to implements. A not uncommon method of handling these rough areas was to disc them down in spring as soon as they were dry enough and sow them over with a grass mixture to build up the sward, but the treatment had certain defects. Land which poaches easily will also dry out very rapidly, so that only a limited area on each farm can be treated before the soil is too hard for discs to be effective. Further, the seedlings which germinate have to contend with hot, dry conditions that do not permit them to compete successfully with other plants such as the remaining grasses and clovers and the almost inevitable crop of buttercup, pennyroyal, etc., which follows the breaking of the turf.

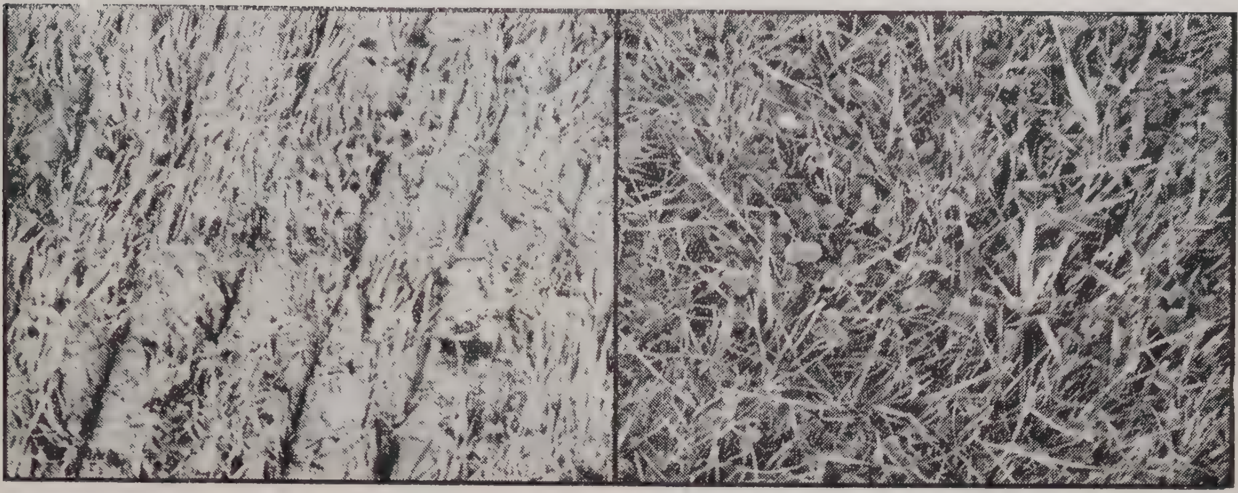
On the whole, the discing and regrassing treatment cannot be recommended because the probability of success is so slight and the risk of weed invasion is too great.

Grading into Lands

An alternative practice to discing and resowing has been to grade fairly-level areas into lands, thus providing a watershed and shallow channels for the disposal of rainwater. These lands may be established either by ploughing or by grading in shallow channels at intervals. The material moved to make the channels should be graded back to form a mid-line ridge between channels so that water is turned into them.

One of the chief defects of this system is that it limits the establishment of subsequent underground-drainage systems, particularly mole drainage, because the surface levels are destroyed. Further, cultivation of the surface almost invariably brings in the first year prolific development of buttercup on the ridges while a few years later the depressions between lands become full of rushes and inferior grasses or water weeds.

On the whole grading into lands is not entirely satisfactory. Certainly it may give better run-off over most of the land, but it will lead to the proportion of a field taken up by depres-

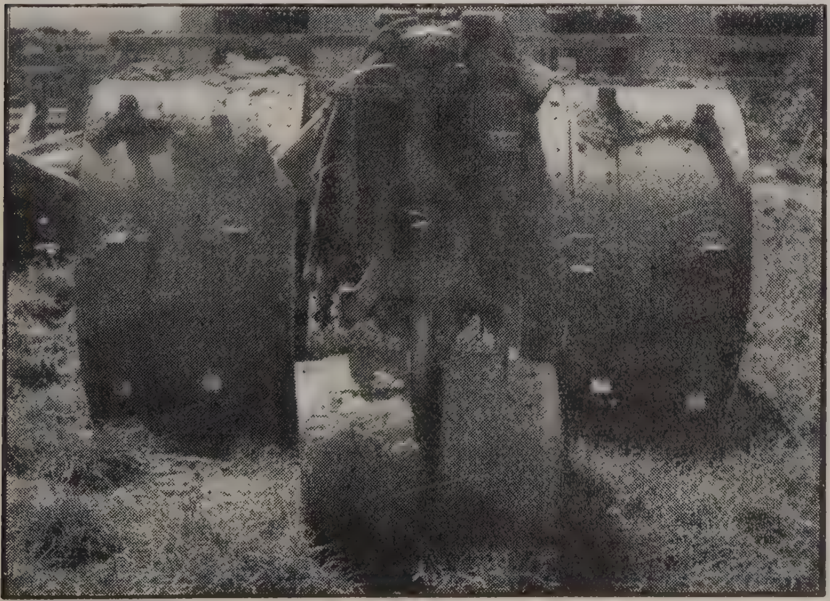


Left—A pasture just after rolling to eliminate the marks of poaching. Right—The same pasture three weeks later. Note the even sward, good development of grasses and clovers, and general vigour.

sions being wet, low yielding, and still subject to poaching, even to an aggravated degree.

Rolling of Swards

Of more recent years, and principally because of the failure of discing and grading into lands to produce a remedy for poaching, consideration has been given to rolling as a means of restoring broken swards to a reasonable level of efficiency. Whether rolling coupled with good drainage can be the complete answer to the problem depends upon an appreciation by the operator of what rolling should aim to achieve and how that condition can be attained. Undoubtedly nothing more is required than the restoration of a continuous sward on the field so that every square foot is growing useful plants and there are no turf breakages which will permit weeds to flourish. To get this condition it has to be appreciated that the softer the soil the more readily will it come together. Further, by working when the soil is very soft only the lightest of rollers will be required to bring about the desired condition. In practice many farmers in the past have done considerable damage to swards by using rollers of such a weight that they have simply buried the pasture. In other cases those with excessively heavy rollers have been unable to commence work until the land had dried out too much so that both the efficiency and extent of their work have suffered.



A tractor fitted with wheel extensions to give it greater bearing surface on soft ground.

Judged by results it is obvious that on really wet country a light Cambridge roller will do an excellent job of restoring pasture and improving the surface. By "ironing out" the land all water lodged in hoof marks is brought to the surface, where wind and sun can do valuable work in removing it.

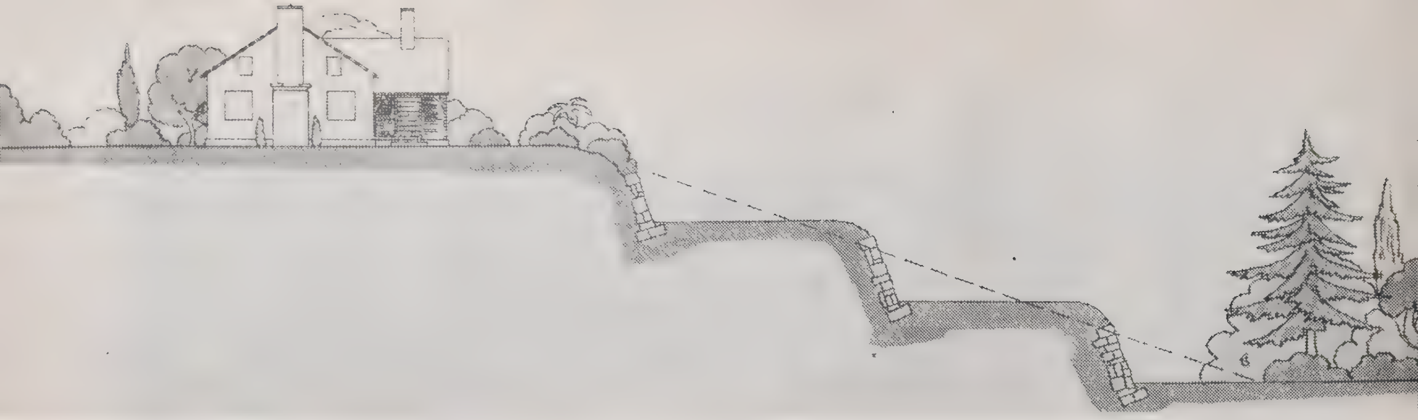
Rolling should be followed by a spell from grazing of about three weeks to enable the surface to dry out and consolidate.

The advantages of rolling in dealing with the problem of poaching are very apparent: A uniform sward is maintained, weeds have little opportunity of establishing, no reseeding is required, no grading or other disturbance of surface levels is necessary, and the work can proceed while the land is still very wet.

While a case has been made for the rolling of poached areas on very heavy land, its usefulness is by no means restricted to these areas. Light, porous soils are also likely to cut up under winter and early-spring stocking and while this takes place the rooting systems are disturbed and exposed. If these are left in this condition until dry weather sets in, affected plants will wither away and leave gaps in the sward. If on the other hand the sward is rolled, the plants will be pressed back into position where they can root afresh and become useful constituents in the pasture.

Summarised, then, the first essential on all poaching areas is a sound drainage system to reduce the water content of the soil. Whether this is an underground or an open system will depend upon circumstances, although the former, if practicable, is infinitely better for reasons already stated.

Finally, provided drainage is efficient and poaching has still to be offset, it is much more effectively handled by rolling the wet land than by discing a drying surface or by grading the country into lands.



THE DESIGNING AND HOME

A FEW decades ago a garden of an acre or more would have been considered a very modest establishment, but today it would be looked on as quite extensive. Nevertheless people today are generally becoming more garden-minded, and a greater and more lively interest is being taken in the small home garden, the designing and creation of which are given special attention in this article by M. J. Barnett, Director of Reserves to the Christchurch City Council.

THOUGH the same fundamental principles of design apply to both large and small gardens, more liberties may be taken with large gardens in more extensive grounds than with those of a few perches. With large areas there is more scope for the liberal use of trees and shrubs and for the introduction of imposing features, but with the small home garden much greater attention must be given to the principles of proportion and balance.

It would be bad planning, for example, to attempt to introduce in the 30 perches, or less than quarter of an acre, which comprise the grounds of the average modern residence, trees or even large shrubs that would ultimately attain dimensions out of all proportion to their surroundings, and which would have a tendency to make the home appear more confined than it really is.

In this respect a good example has been set in America by the liberal use of dwarf conifers such as the Irish yew, dwarf cypress, dwarf junipers, and others of a similar habit. Such shrubs and diminutive trees are symmetrical in habit without being too stiff and formal, are of good appearance at all seasons of the year, and are easily kept within bounds, though a few in the course of years may outgrow their surroundings.

Preparing the Plan

When designing a new garden or when reconstructing an old one, no matter how large or small, greater satisfaction will be achieved if a plan is first drawn to scale showing the position and exterior dimensions of the house and all outbuildings, the boundaries of the property, the entrances and exits, and the main features that will compose the garden.

It may be necessary to engage a competent landscape architect, but any person with a fundamental knowledge of drawing to scale can prepare a ground plan that will be a sufficient guide to which to work. It is simple enough to obtain and put down on paper the position, length, breadth, and direction of the boundaries, and it is by no means difficult to delineate the position and the outline of the foundations of the building by taking certain measurements from the boundary lines to the fixed points of the foundations.

The buildings having been defined on the plan, the next step is to delineate the position of the pathways or the means of ingress and egress. As a general rule in a small garden the means of access should approach the entrances to the residence or the locality they are to serve by the nearest possible route. If not, there is always a tendency for the irresponsible and the obstinate to take the shorter way, even if it means crossing over a lawn or perhaps stepping over a flower bed to the detriment of either. Such people may be deterred, however, by placing a trellis fence or a few shrubs such as roses at the point where the taking of a short cut seems natural.

The curve is the line of beauty, and where possible a pathway with a gently-sweeping outline is preferable, but in small gardens the straight or formal outline may have to be adopted. If, however, the property is on a steep slope, the means of access must follow a gradient, in which case the grade of the pathway should be made as gentle as possible, even if it means a longer deviation from the shorter but steeper way. Better an easier grade than a series of steps that are always an obstacle to the perambulator, the elderly, and the halt. The use of steps is not condemned; well placed and properly constructed, they are things of beauty and can be used as a fitting adjunct in the garden plan, but their use in pathways that give direct access from the street to the residence should be restricted to a minimum and if possible avoided.

With the pathways defined the next step is to consider the utilisation of the balance of the property surrounding the residence and how it may be designed and planted to the best advantage. Points to be determined in this connection are the amount of space to be devoted to lawn and where it will be best situated, the areas that will be available for the growing of flowers, what trees and shrubs will be used and where they will be planted, the amount of space, if any, that will be required for the cultivation of vegetables and fruits, the area necessary for the drying green, what amount of space children may have to themselves where they may play in safety, and what special features such as a small water garden, a fountain, a rock garden, a summer house, a bird bath, or a sundial it is intended to introduce. All should receive careful consideration, not only as separate units, but as part of the general composition. The objective should be balance and harmony between the individual features that compose the garden, which in turn should be in keeping with the architecture and size of the building.

Naturally the two factors which govern the development of any plan are the cost of the project and the type of situation to be dealt with. Where steep slopes have to be converted into gardens the cost of development will be considerably more than for a similar area on flatter land. More ingenuity and more careful thought will be called for, and yet a steep slope in some respects offers greater possibilities in garden design than one on the flat. (See illustration at top of this page.) Such slopes provide ample scope for the inclusion of terraces, rock gardens, and the like, which are more difficult of achievement if natural features do not exist and if drainage is difficult to obtain.

Very pertinent to the subject of garden planning is the advice of Lord Bardolph in Shakespeare's play "Henry the Fourth." "When we mean to build we first survey the plot, then draw the model; and when we see the figure of the house, then must we rate the cost of the erection; which if we find outweighs ability, what do we then but draw anew the model in fewer offices, or at least desist to build at all." If the word garden is substituted for house, this might well be adopted as the garden planner's guide, with the exception of the last line, "or at least desist to build at all." If the plan is too ambitious, by all means draw afresh "with fewer offices," but it should be remembered that Rome was not built in a day, nor is it necessary to complete the work involved in designing the garden in one year. By all means complete the design on paper, but putting it into effect may take several years, when the cost spread over a period will not be such a heavy burden as it would be if it were all incurred at one time.

First prepare the plan and then persevere with the work necessary for its consummation. Temporary expedients will suffice until it is practicable to add the permanent features. With a definite objective in view it will be found ultimately that expense will be saved and dissatisfaction and disappointment avoided.

Making the Garden

The first business in putting the plan into operation is to see that every cubic foot of topsoil—the organic soil containing humus—is conserved, even if this entails double the amount of labour in shifting it. If a house is to be built, a pathway formed, or the garden to be altered in such a way that the removal of soil is necessary, the topsoil should not be buried under the clay and rock removed during excavation.

The Boundaries

If the boundary fences enclosing the garden are of palings, materials used should be the best procurable. Too frequently dilapidated fences partially broken down or with a drunken list give an impression of neglect and lack of civic pride.

LAYOUT OF A SMALL GARDEN

The posts should be of concrete and the palings and rails, if of soft wood, should have been impregnated previously with a preservative. Paling fences may be an eyesore, but if they are securely erected, plants such as espalier fruit trees, wistaria, clematis, or climbing roses, which require protection from keen prevalent winds, may be grown against them. A few No. 10 gauge wires stretched at intervals of about a foot apart and about 2in. out from the fence along its length will provide adequate support for tying and training, and are much to be preferred to tacking the stems of plants to the palings, which is both irksome and detrimental to the plants.

Ivy provides an excellent evergreen covering for any fence. It should be trimmed well back to the main stems every year in early spring just before new growth starts. It has been claimed that ivy assists in the decay of woodwork, but it has been the writer's experience that it actually serves as a support. It is true that if allowed to grow unchecked, ivy will in time force its way into small crevices in masonry and hasten its disintegration.

Hedges

Hedges, which are very often used to define boundaries, provide shelter, but do not offer the advantage of an area against which to grow the more tender plants. The powerful rooting systems of some of the more vigorous hedge plants, on the other hand, impoverish the soil for some distance outward to the detriment of smaller subjects. A flourishing, well-furnished, and well-kept hedge is, however, a thing of beauty and a joy in any garden.

Hedges are generally so easily grown that there is an inclination to treat them with indifference and not to expend on them the care they deserve. The soil of the area in which they are to be planted should be deeply cultivated—to a depth of 2ft. if possible and for a width of at least 3ft. All pernicious weeds should be scrupulously removed and, if possible, a liberal amount of manure or compost incorporated with the soil at a depth sufficient to preclude the roots of the plants coming in contact with it at the time of planting.

At the end of winter or in early spring the young plants should be headed back sufficiently to induce them to stool out and develop a denser growth.

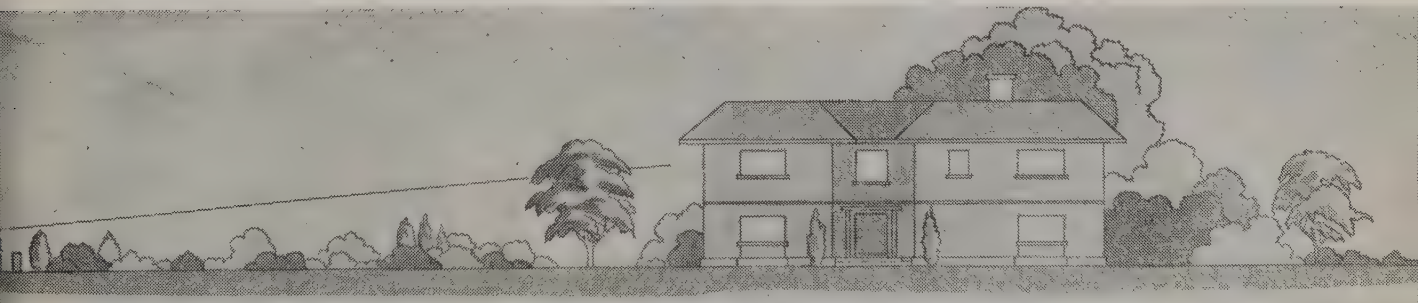
Regular trimming of established hedges is necessary once or twice a year to encourage compact and uniform growth. Hedges should always be trimmed closer in toward the top than at the base, the object being to achieve a shape resembling an inverted V with a flat or rounded top. As a hedge naturally grows more vigorously at the top than at the base, pruning straight up instead of in toward the top eventually results in its becoming wider at the top than at the base. It then not only appears unsightly, but the base, deprived of its fair share of light and air, begins to die out, and when gaps occur a ground draught with its ill effects is created. For the same reason weeds which compete with the lower branches for light, air, and sustenance must always be kept down.

Convolvulus is one of the worst weeds affecting hedges, but even it may now be removed by the new hormone weedkiller without injury to the host plant. Spraying of the weedkiller over the hedge will of course have disastrous effects on both hedge and convolvulus, but if some of the leaves and tendrils of each convolvulus shoot are dipped into the solution, only the weed will be affected. The operation may be a tedious one, but will prove effective if carried out when the convolvulus is in vigorous growth.

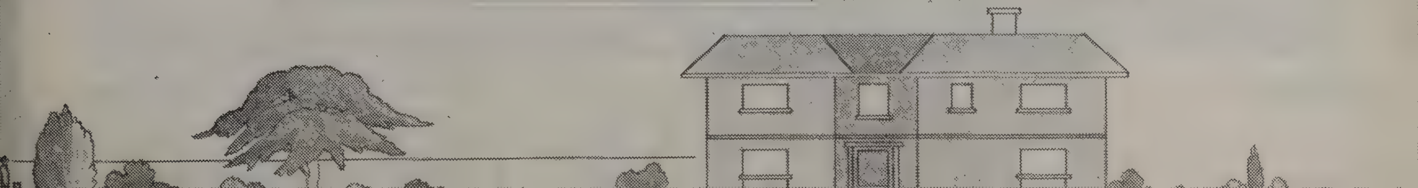
The Pathways

An ill-constructed pathway with an uneven and broken surface and with a ragged and ill-defined outline detracts from any garden.

The finished surface of the pathway may consist of stone flags arranged in regular design or as crazy paving. If stone is not available, concrete may be used either as prefabricated sets in one or more sizes, or, as is usually the case, poured wet on the job. It may be designed in brick or in plain asphalt.



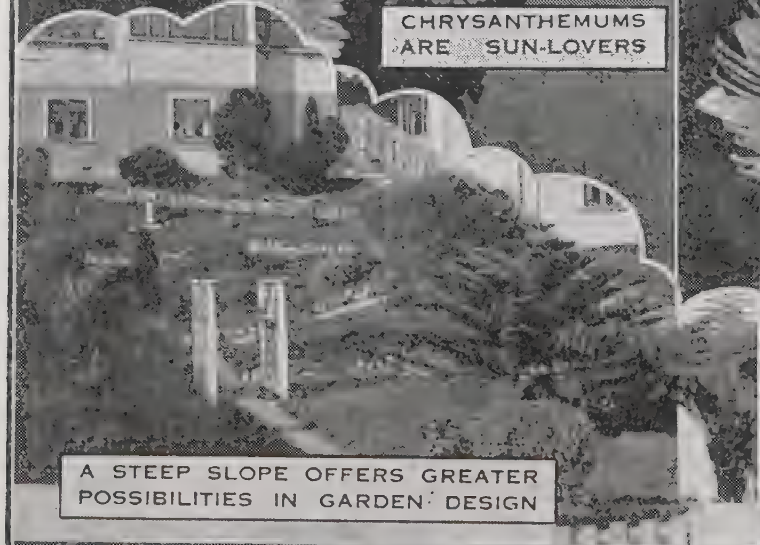
ABOVE—THE RIGHT WAY OF PLANTING FOR EFFECT
BELOW—THE WRONG WAY OF GROUP PLANTING



PLANTING THE SMALL GARDEN

CHRYSANTHEMUMS ARE SUN-LOVERS

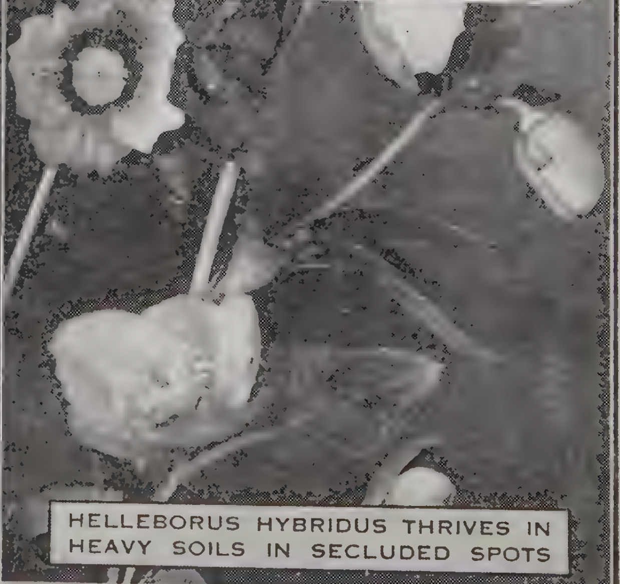
PROTEA LONGIFLORA THRIVES UNDER ADVERSE CONDITIONS



A STEEP SLOPE OFFERS GREATER POSSIBILITIES IN GARDEN DESIGN

GAZANIAS WILL FLOWER ON A WALL FOR MONTHS EACH YEAR

ALICE RHODODENDRON, CONSPICUOUS FOR THE BEAUTY OF ITS FLOWERS



HELLEBORUS HYBRIDUS THRIVES IN HEAVY SOILS IN SECLUDED SPOTS

Photographs: Top left and middle right Photo News Ltd.; bottom left and top and bottom right Douglas Elliott.

Whatever material is used, good workmanship is necessary. The ground underneath should be well consolidated first, and if it is of a clayey nature, a porous course of broken brick, small rubble, clinker, or cinders is necessary to provide a stable foundation. This is particularly important where concerte is to be put down, otherwise expansion and contraction of the soil underneath or the passing of vehicles over it may cause cracking and breaking of the surface. The edges must be regular throughout, well defined, and permanently fixed. Drainage is also important, and where heavy rains are to be expected sufficient fall or camber should be given to dispose of surface water.

When constructing a pathway across or down a slope even greater care is necessary. On the one side it is necessary to excavate and on the other there is formed an embankment of the soil removed from the cut. If this embankment or fill is not thoroughly consolidated before permanent surfacing is done, subsidence will follow. In such cases it is also important to provide a channel for the run-off of surface water, which, if it is allowed to run or trickle over the outer edge of the pathway, will gradually erode the retaining soil of the embankment, eventually causing trouble to the surface of the path. The permanent fixing of the bank or cut on the inner side of the pathway will also require attention. The concrete wall would at first appear to be the answer, but concrete always has a harsh appearance and is particularly glaring in sunshine, though colouring materials which may be added to the cement will harmonise it with the colour of the house and surroundings.

The Stone Wall

A better method of treating banks or cuts is by facing them with stone, and the stone wall itself can be made a very attractive feature of the garden. If faithfully constructed it will serve the dual purpose of acting as a retaining wall and as a wall garden.

To obtain a solid foundation for a stone wall the soil below the surface should be excavated until a solid base is reached. The first or foundation stones should be set firmly in place with the widest and heaviest side to the bottom, but inclining inward toward the bank. When the first row is laid all spaces should be filled in with soil well mixed with rotten rock particles or similar material to keep the compost open and so permit moisture to percolate. Every care should be taken to see that all crannies and interstices are well filled with compost and that no air pockets remain. Building up of the wall should proceed in the same manner, using the stone in such a way that each piece fits in evenly with those below; they should interlock and be so firmly fixed that it is impossible to prise one piece loose from the whole. Each piece of stone should incline inward and downward toward the bank and not outward, thus giving greater stability to the wall and preventing stones being forced out of place by the pressure behind. The inward and downward inclination of the stones conducts moisture toward the roots of any plants grown on the wall, instead of away from them, as would be the case if the stones had a slight dip toward the outside.

Planting is difficult after the wall is built and may be more effectively performed as building proceeds. At convenient intervals as the wall is built a plant is placed carefully in one of the spaces between the stones which have already been filled with compost. The roots are spread out fanwise toward the back, with the crown of the plant to the front and just clear of the stone face so that it will not be crushed. When the roots have been covered with soil building proceeds until a sufficient interval has been gained to allow another plant to be incorporated in the wall.

Plants especially adapted for wall gardens include most of the alpine pinks, such as *Dianthus caesius*, the blue *Lithospermum prostratum*, the pale blue *Convolvulus mauretanicus*, the alpine phloxes, such as *Phlox subulata* Vivid; the white *Campanula fragilis*, and *Gypsophila repens*.

Rock walls that also serve as retaining walls should not be built perpendicularly; it is essential to give greater stability by allowing a slope toward the back of 2in. in every foot of height. Thus the face of a wall 4ft. high would incline inward 8in. from the base to the top.

To assist the builder to obtain the correct slope or "set" to the wall throughout its length a number of templates, which are easily made out of strips of timber, are usually employed. A straight stake is driven vertically into the ground at the base of the wall; a thinner strip of timber is fixed to the stake at ground level and held in position by a cross-piece from the top of the stake to the strip. Thus if the wall is to be 4ft. high, the length of the stake above the ground will also be 4ft., and the cross-piece will be fixed at right angles to bring the thinner strip 8in. out from the upright.

If the bank to be walled is a high one, say of 8ft., it is wiser, instead of constructing a continuous wall to the full height, to break it at half way and build it in two tiers, the second tier being set 2ft. back from the first. The 2ft. wide space at the break in the wall may be used for the growing of plants that do not take kindly to being treated as wall subjects.

In designing gardens on land that has a sharp slope the use of the stone wall will prove of great advantage, especially where it is necessary to terrace the ground so that it may be conveniently cultivated and to prevent loss of soil by erosion.

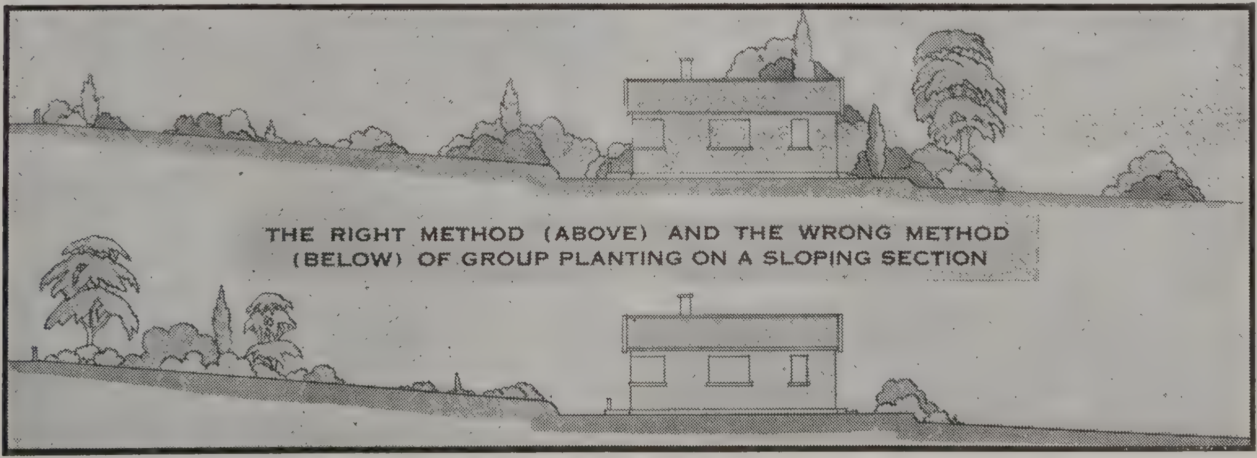
Trees

When planting trees the following points should be considered:—

The ultimate dimensions which the specimen it is desired to plant will attain.

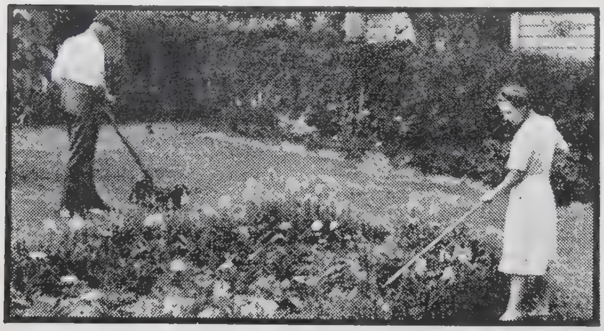
Its general habit—whether it is upright or spreading; whether it is a deciduous tree or an evergreen, and whether it has attractive foliage, attractive flowers, or both.

The exact position in which it is to be planted so that it will form part of the general composition of the garden. If it is planted in the wrong place, it may, when it matures, completely upset the balance of the garden design.



THE RIGHT METHOD (ABOVE) AND THE WRONG METHOD (BELOW) OF GROUP PLANTING ON A SLOPING SECTION

PLANTING THE HOME GARDEN



[*Sparrow Industrial Pictures Ltd. photo.*

The lawn is an essential part of any garden plan, and no matter how small the garden area available, some portion should be devoted to lawn space.

Trees must be used with discretion in any planting scheme. Too frequently obsession with the idea that a few trees are necessary leads to their being planted wherever space may be found. They may grow to such a height that they obscure the view from one of the windows, or they may obscure the sunlight in winter, when it is most appreciated. Sometimes by accident rather than by design they are happily placed and ultimately become a feature of the home and the neighbourhood, but too frequently they become too large for the space allotted them and have to be pruned back periodically. A mutilated tree is rather a pitiful thing.

Many trees, especially some of the conifers such as the deodar and the blue spruce, are particularly attractive in their juvenile form, and a gardener viewing them in a nursery or in a florist's window is perhaps persuaded to try them, only to find in after years that instead of requiring a space of a few square yards, they demand almost the whole of the front garden. Or a treasured seedling wattle tree or some other rapid-growing specimen which, in the enthusiasm of its chance acquisition, is planted with commendable care, in a very few years may become a rampant tree, to the detriment of smaller but more beautiful subjects. Even in well-planned schemes certain dwarf trees may in the course of time become too large for the position allotted them.

Fortunately the number and types of trees from which to choose are not limited. It is possible to obtain trees that will not grow more than a few feet high; tall and stately specimens; trees that will thrive in wet and cold soils, in poor soils, in dry and in exposed situations; trees that are specially adapted to meet the requirements of almost any environment, no matter how adverse the conditions may be.

Trees or large shrubs whose height will tend to dwarf the residence should not be planted in the front of the section. For instance, a few trees reaching a height of 10ft. or more in front of a building with an average height of about 15ft. will make the building appear smaller. On the other hand a tree of the right type planted to one side or at the rear of the residence will throw the lines of the building into relief and assist in relieving any impression of squatness. A large, spreading tree—a horizontal elm for instance—placed in the centre of a lawn, say 40ft. square, will in time usurp the whole of the space and make the area appear restricted.

Shrubs

With the many thousands of shrubs to choose from, the small gardener has far more opportunities for the use of shrubs than of trees. There are shrubs especially adapted for use in almost every situation; miniature shrubs such as the helianthemums for the rock garden; the little mat-like ones such as the wild thyme for the path or crazy pavement; plants such as the dwarf lavender and catmint eminently suitable for edging borders and pathways; trailing shrubs such as the prostrate rosemary for the rock wall; creeping shrubs such as the prostrate cotoneasters and junipers so useful for covering embankments and to prevent erosion; climbing and rambling shrubs such as the jasmine, clematis, and honeysuckle for covering trellis work or for screening bare walls; shrubs that provide shelter and others like the rose, the hydrangea, the rhododendron, and the azalea that are conspicuous for the beauty of their flowers, their fruit, or their foliage. All have their uses, and points to decide when planning the garden are which ones to choose, where they will be planted, and for what purpose they will be used.

No attempt should be made to grow in unfavourable situations those popular plants so often bearing the recommendation, "No garden should be without them." Everyone loves the rose, the rhododendron, and the azalea, but effort should not be wasted in trying to induce such plants to grow in a windswept situation, or where the soil is extremely sparse, when there are such shrubs as the several kinds of cistus, cytisus, and proteas that will thrive under such adverse conditions.

Pruning: Many shrubs have been ruined through ignorance of when and how to prune. Before any pruning is attempted a knowledge of the time of flowering and on what particular wood or growth the flowers are borne is necessary. If many of the best shrubs, such as forsythia, the ceanothus, and the philadelphus, which flower in spring and early summer, are pruned in winter when the garden is receiving its annual overhaul, much of the flowering wood is removed. Shrubs such as the holly, the rhododendron, and the camellia, which naturally form shapely bushes, require little if any pruning; if any is necessary to improve the shape or to keep them within bounds, they should be pruned when winter is over and just before new growth commences.

The main principles in pruning are:

Prune to induce shapeliness, the main object being to endeavour to retain the natural poise and character of the subject. (An exception is made where examples of topiary work are required.)

Prune to remove all dead, dying, decayed, and diseased wood, and all weak and superfluous growths.

Prune to induce new and vigorous growths necessary for the rejuvenation of the subject.

Prune to encourage the production of flowers or fruit; fruit is dependent on the production of flowers.

The Lawn

The lawn is an essential part of every garden plan, and no matter how small the area or how difficult to design, some portion of it should be devoted to lawn space. (Full information on the establishment of a lawn was contained in an article by F. Sydenham on page 295 of the March, 1948, issue of the "Journal," which is also available in bulletin form (No. 309) from any office of the Department of Agriculture.)

The Flower Garden

Though in the small garden it is almost impossible to set aside an area especially for the display of herbaceous flowering plants, and bedding and border plants are usually accommodated wherever it is convenient, planning is again necessary. As most popular herbaceous plants demand the best of treatment, good soil, and at least reasonable protection from boisterous winds, the better parts of the garden should be reserved for them.

The stately delphinium requires a deep, rich soil and adequate protection; the perennial phloxes will not tolerate any dryness at the roots, but succeed better when protected from the burning rays of the sun and will thrive in a partially-shaded position better than many others; the chrysanthemum is a sun-lover; the carnation, too, requires a well-drained and friable soil and an open situation; the hellebore, on the other hand, prefers a heavy soil and thrives in secluded spots between bushes of rhododendron or the like; lilies require good drainage, a deep rooting medium, and complete protection from cold and parching winds; the heucheras, on the other hand, will tolerate an exposed position and will succeed even in a relatively-poor soil; the perennial scabious relishes lime, but lime added to the soil will encourage the spread of disease in bearded irises.

Do not overlook the use of the small bulbous plants such as the snowdrops, the chionodoxas, the scillas, the autumn-, winter-, and spring-flowering crocuses, the muscari, etc., that are so easily placed in odd corners, between stones, or underneath deciduous shrubs and which add charm, interest, and beauty wherever they are planted.

CARE OF LIVESTOCK DURING MAY

Contributed by the Animal Research Division.

AS soon as the cows have been dried off arrangements should be made for the milking machine to be overhauled by a competent expert.

MILKING MACHINE OVERHAUL

Do not install complicated gadgets, but make sure that all parts of the machine are working efficiently. This will not only ensure rapid, trouble-free milking, but is likely to increase production and will help to reduce mastitis. The Department's Bulletin No. 260, "Mechanical Milking," should be carefully studied by every dairy farmer.

* * *

UNTHRIFTY CALVES

At the first sign of unthriftiness calves should be drenched with phenothiazine, giving the full dose recommended on the label. Drenching, however, will not be effective unless the calves are properly fed. The best feed for calves is good fresh pasture and this can be provided by rotating the calves through the cow paddocks. Good-quality hay is necessary to supplement the sappy young autumn pasture.

* * *

INOCULATION OF DOGS AGAINST DISTEMPER

Distemper in dogs can in a very high percentage of cases be prevented by vaccination. This is best done when the pups are 3 to 4 months old. As the virus, which has a short life, is imported from Australia, the veterinarian should be notified at least a month before the pups are to be vaccinated.

PREVENTION OF SUCKING BY CALVES

Sucking of each other by calves is a habit which should be broken as soon as it is detected. The insertion of a bull ring is effective in most cases.

* * *

AUTUMN-SAVED PASTURE

In most districts there is still time to provide good winter grazing by shutting up paddocks and letting them grow during the autumn and early winter. Autumn-saved pasture is invaluable for early-calving cows. It also provides the best insurance against sleepy sickness in ewes. If necessary silage should be fed to cows now to enable some paddocks to be shut up. Once the ewes have been tupped they are all the better for being done fairly hard until 3 or 4 weeks before lambing. This will also enable some paddocks to be spelled. Further particulars about autumn-saved pasture will be found in an article in the February issue of the "Journal."

* * *

PURCHASE OF HERD SIRE

If a new herd sire will be required this year, now is the time to make inquiries. The New Zealand Dairy Board issues a Sire Survey and Merit Register which gives the production of the daughters of all dairy sires which have been surveyed. Unfortunately very few progeny-tested sires are available, but the register should be consulted and wherever possible a son of a proven sire should be selected. Bull catalogues issued annually by the Herd Improvement Associations should also prove of considerable value to dairy farmers who are looking for herd sires.

RAILWAY WAGONS and TARPAULINS

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Mr. Wagon User! Do you fold the tarpaulins and close wagon doors after unloading at your delivery station? If you already assist in this direction, the Railways are grateful; but if you do not, your co-operation in the future would be appreciated. Unfolded sheets and open doors cause train delays, especially at flag stations. And nobody can afford to lose time these days. By leaving tarpaulins and wagons in proper order for quick pick-up you'll help the Railways to help wagon-users in general.

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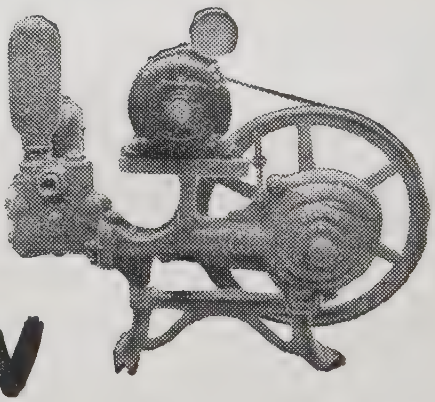

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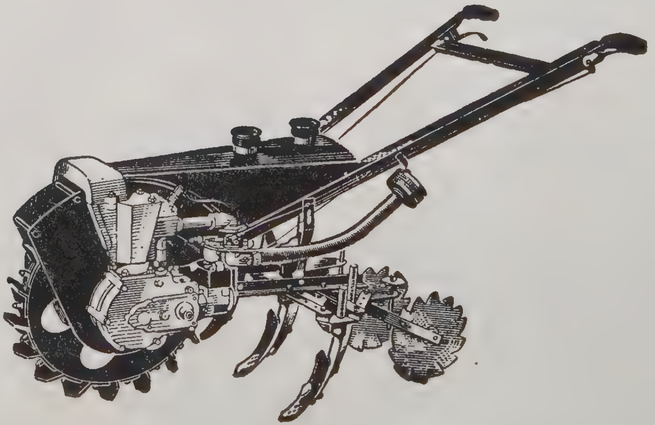

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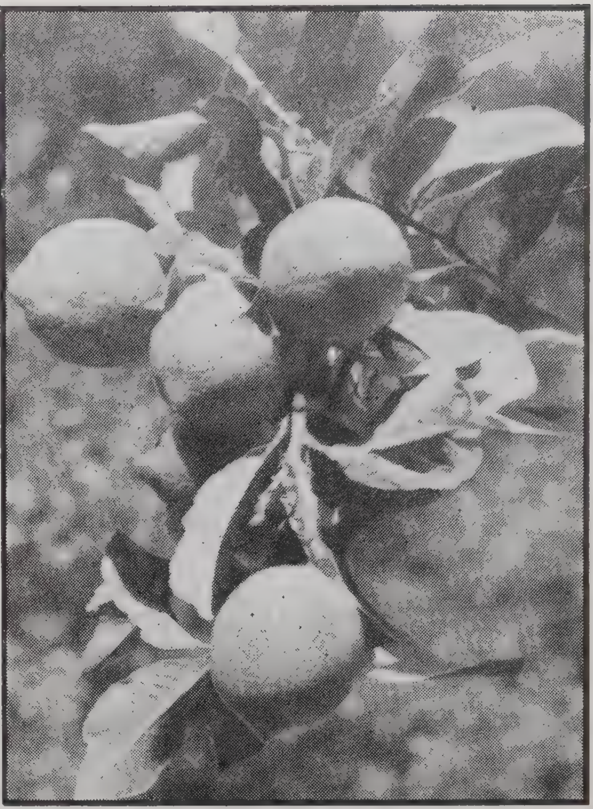
THE PRUNING OF CITRUS TREES

CITRUS trees are so different from most other kinds of fruit trees that the question "How should they be pruned?" is often associated with another query: "Should they be pruned at all?" In reply to those questions widely-different theories are advanced. One fairly commonly-accepted belief is that citrus trees require no pruning; directly opposed to that is a less popular theory that their naturally-luxuriant foliage should be very severely thinned. Careful observations of the results of different practices indicate that the solution lies somewhere between these extremes, but that all kinds should not be treated alike. Light to moderate pruning can be used to advantage but, except in special circumstances, severe pruning of citrus trees is very unprofitable. Principles and methods of pruning are described in this article by I. L. Nottage, Orchard Instructor, Department of Agriculture, Auckland.

THE primary objective of all pruning is control of tree growth—planned direction of energy toward maximum fruit production and the tree strength and vitality without which production could not be sustained. No pruning system can be followed intelligently without knowledge of the growth and fruiting habits, the general requirements, and the weaknesses of the trees to be pruned.



[Sparrow Industrial Pictures Ltd. photo.

The primary objective of all pruning is the planned direction of the trees' energy toward maximum fruit production.

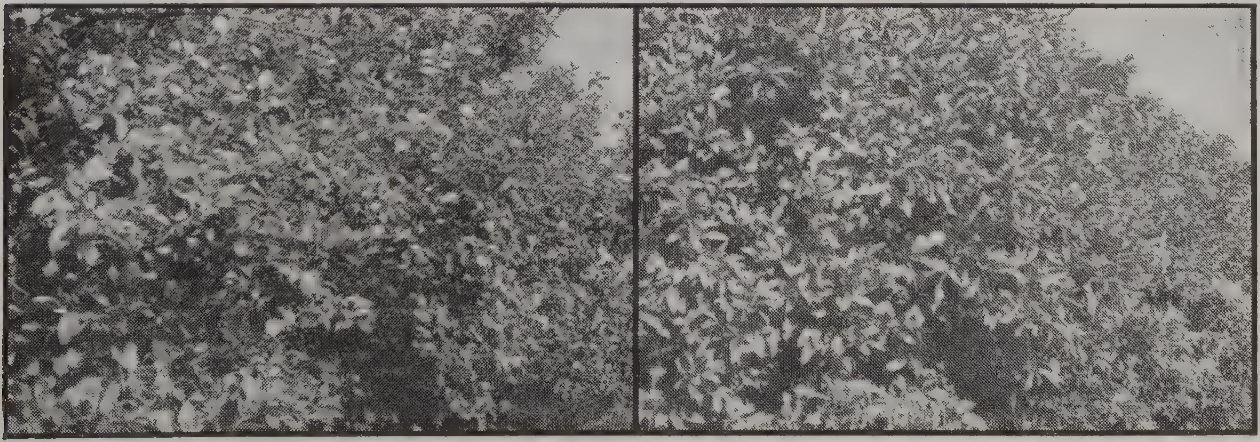
Characteristics of Citrus Trees

Apples and peaches are perhaps the two fruits most commonly grown in New Zealand; the trees are very much alike in many respects, but there are important differences between their pruning treatments. How much more important must it be to make allowances for the almost entirely-different citrus family—to consider their natural habits before deciding how they should be pruned.

Citrus trees are evergreens, natives of countries with mild climates and generous, well-distributed rainfalls. They produce several flushes of growth each year but have no sharply-defined dormant periods. Tree growth virtually stops for about 2 months in winter, and for shorter periods between spring, summer, and autumn flushes of growth, but fruit continues to swell and mature even while tree growth has ceased temporarily.

Citrus trees are unable to withstand the effects of frost, or even of cold winds. Their branches, naturally shaded by domed canopies of leaves, have become powerless to resist the damaging effects of strong hot sunlight.

Luxuriant foliage, spreading low around the trees, shades the ground, reduces air movement around and beneath the trees, and retards the rate of evaporation of soil moisture. In hot, dry weather this service is of real value.



[Sparrow Industrial Pictures Ltd. photos.

Healthy, bearing lemon trees (left), showing their loose and irregular habit of growth compared with the more compact and regular forms of New Zealand grapefruit trees of the same age (right).

PRUNING OF CITRUS TREES

[*Sparrow Industrial Pictures Ltd. photo.*

A sturdy young New Zealand grapefruit tree 12 months after being planted. Side growths below the main branches should be removed at this stage.

Most kinds of citrus trees blossom in late spring—November and early December—and, according to variety, mature their fruit between June and November of the following year. Lemon trees have the unusual characteristic of producing both flowers and fruit at all seasons, but the heaviest crops are harvested between late autumn and spring or early summer.

Nearly all citrus fruits, except lemons, are borne on terminal twigs of the current season's growth. Lemons are also produced on young wood, but many are carried on older lateral branches. Therefore, while other citrus fruits grow chiefly on or near the outer surfaces of the trees, lemons are much more evenly distributed.

Lemon trees are somewhat less regular and compact in form, but citrus trees as a whole grow naturally into well-shaped trees, with rather dense canopies of foliage. They have adapted themselves to withstand the effects of the climate in which they are grown.

Lightest Possible Pruning Best

The results of various pruning methods indicate that judicious but moderate thinning out of their branches assists young trees to build sturdy frameworks of limbs. There is evidence that reasonable thinning out of their weaker branches improves at least some kinds of citrus trees, notably lemons and certain varieties of mandarins. Some measure of control of the height and spread of the trees can be effected without ill results, and removal of dead or diseased wood has obvious advantages.

Severe pruning of healthy, vigorous, bearing citrus trees undoubtedly causes a substantial reduction in the quantities of fruit produced. There is little or no compensating improvement in size or quality of fruit compared with that from lightly-pruned healthy trees.

Hard cutting can be undertaken with advantage only in special circumstances. Severe pruning plays an important part in the renovation of trees which have suffered a serious setback, such as that caused by a severe frost.

The natural growth and fruiting habits of citrus trees, their need for an ample cover of foliage, and their observable responses to various methods of pruning all indicate that normal, healthy trees require only light to moderate pruning.

The amount of pruning should be varied to meet the requirements and to take advantage of the responses of different kinds, ages, and conditions of trees. In general, citrus trees should be given the lightest possible pruning that will keep them healthy and sturdy.

Therefore, the pruning methods described in this article are based on a minimum of interference with the natural growth of the trees. There is no reason to believe that more severe treatment will have any long-term advantages, and it may well result in a considerable reduction in crop.

Time of Pruning

For light or even moderate pruning a great deal of latitude in timing is permissible. Light branches may be thinned out or dead and diseased wood removed at any season without detriment to the trees; in fact, a considerable amount of such work is carried out by many growers, especially of lemons, while they are picking the fruit.

Should heavier cutting become unavoidable, timing becomes much more important. Low branches or those around the sides of the trees may be cut out, thinned, or shortened at almost any time; to avoid loss of fruit, such work is usually carried out at the end of the harvesting season. With lemons some loss of crop is unavoidable, but this class of pruning can usually be undertaken after the main crop has been picked.

When pruning involves extensive thinning out of top branches, it is unwise to open up the trees while frosts are likely to occur or to expose the insides of the trees to strong direct sunlight in hot weather. By pruning early in spring, just before the first flush of growth appears, both dangers are avoided. Frosts will be past, and there will be ample time for gaps in the tops of the trees to be reasonably well covered by new growth before very hot weather is expected.

Very severe pruning must be done as early as possible in spring, but not while there is still a risk of damaging frosts.

Young non-bearing trees should be pruned as soon as risk of frost damage is past. They are then able to throw the whole of their energies during the full growing season into developing those limbs which have been selected to form their main frameworks.

Pruning Young Trees

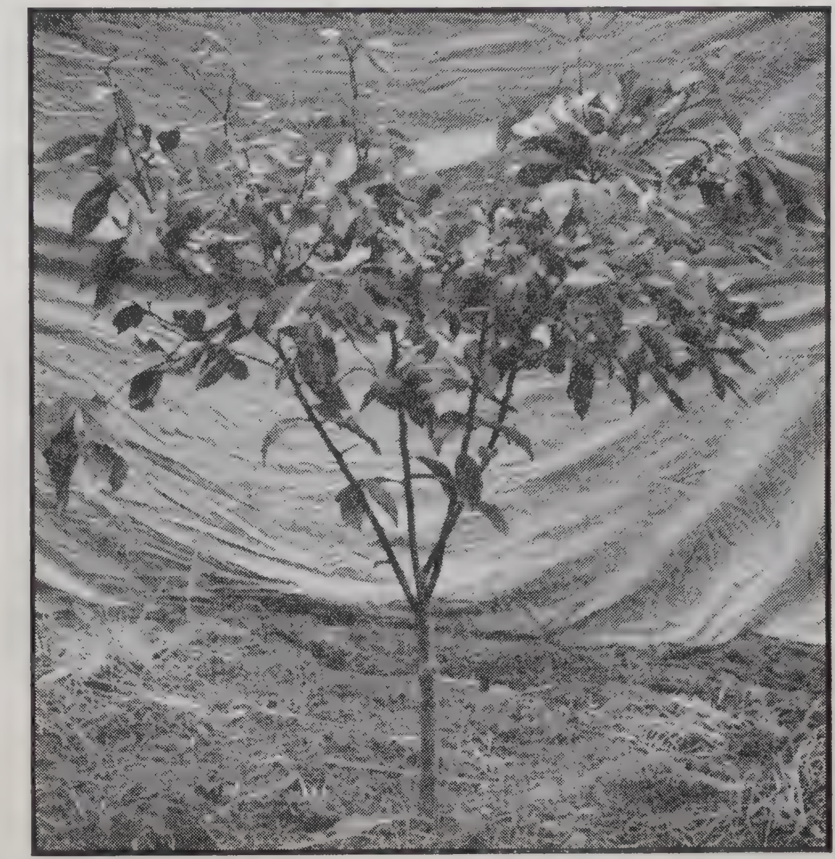
Young citrus trees should receive their first pruning at planting time. Damaged or badly-twisted roots should be cut back neatly to sound, healthy wood before the trees are planted. One-year unbranched trees must then be headed back to the desired height above the ground. A year later the branches for the main framework limbs can be selected from those arising within the upper 6 to 9in. of the trunk. Trees planted with well-branched heads usually require some cutting back to balance the loss of roots when they are lifted from the nurseries. Advantage may be taken of this opportunity to select 3 or 4 well-placed main branches, which should be shortened to 6 to 9in., according to the strength of the roots. Very well-rooted trees require little or no pruning. If possible, branches arising from different levels around the trunks of the trees should be chosen; if several branches originate from the same point, they are likely to split apart in later years when heavy crops weigh them down.

If weak, poorly-developed trees must be planted, it is unwise to prune them at all provided they are well rooted. They will establish themselves more easily if they are not deprived of the small amount of top growth they possess. Pruning can be done a year later, when the trees should be in better condition to stand it.

Young trees which fail to break into sturdy growth early in spring should be completely defoliated to reduce loss of moisture through transpiration. They frequently respond with an almost immediate burst of young growth.

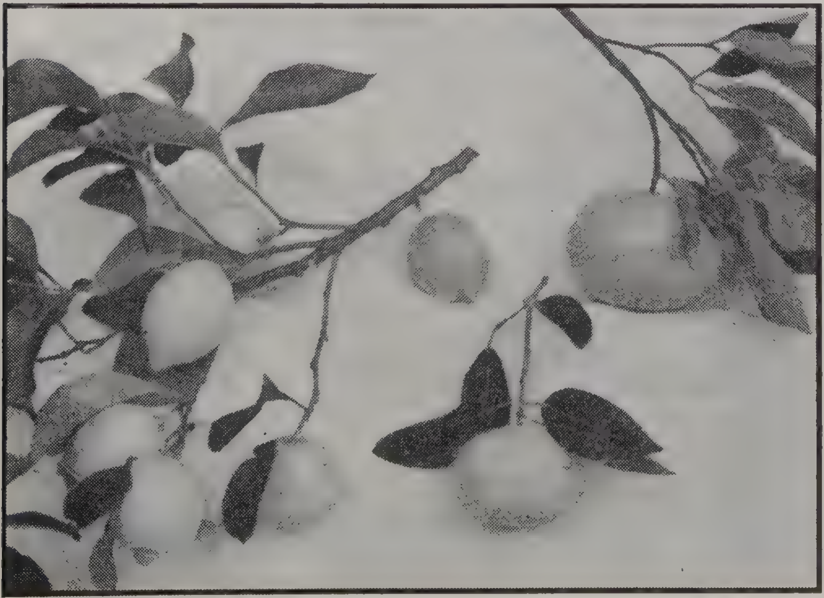
During the first year all shoots must be rubbed from the stock (below the bud union) while they are young and tender. Removal of shoots from above the bud union is neither necessary nor desirable, except that an occasional very strong one may be pinched back to prevent it competing with the main limbs.

A year after the tree has been planted all side growths below the main branches should be removed. From 4 to 7 sturdy branches, according to the size and vigour of the tree, should then be chosen to continue as principal limbs. Unwanted vigorous branches which might compete with the selected main limbs, and any strong branches which cross horizontally through the centre of the tree, should be cut out. All other healthy wood and foliage should be left.



[*Sparrow Industrial Pictures Ltd. photo.*

A well-formed young lemon tree 18 months after being planted.



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Citrus fruits are carried chiefly on terminal twigs like the New Zealand grapefruit on the right. Lemons grow on older wood as well, as on the left.

Occasionally a small weak tree produces very strong, almost vertical growths from points above the bud union on the main stem or trunk. If the shoots are 1ft. or more above the ground and are suitably placed, very often they can be used as main limbs. Excessively-tall shoots must be headed back to the general level of other branches. Sometimes an exceptionally-vigorous shoot takes command, leaving the original head weak and unthrifty; in a few such instances it is advisable to cut out the old stem and to build a new head from the more vigorous young growth.

All young citrus trees may be treated alike, regardless of kind or variety. The trees will suffer little or no harm if a few doubtful branches are left uncut, but hasty and ill-considered pruning out of too much wood may easily give them a serious setback.

Pruning Non-bearing Trees

Full advantage should be taken of the first 7 or 8 years after planting, for in the lives of citrus trees these are the years during which the greatest influence may be exerted on development of sturdy main limbs with the minimum of pruning. While the trees are young and are growing rapidly, pruning wounds heal over

PRUNING OF CITRUS TREES

[*Sparrow Industrial Pictures Ltd. photo.*

Laterals from a lower limb which touch the ground should be removed. The limb need not be cut out as long as it remains well clear of the ground.

very quickly. If regular annual pruning is carried out, undesirable branches may be removed before they grow large; consequently the trees suffer no setbacks through losses of large limbs or quantities of foliage. Because little fruit is expected during these years, pruning may be directed toward long-term welfare of the trees, with no great need to be concerned about its immediate effect on production.

In these formative years there will be only minor differences in the treatment of various kinds of trees, but lemons, Meyer lemons, and such varieties of mandarins as Thorny and Clementine will require rather more pruning than will most other citrus trees.

Lemon trees are inclined to be more open and irregular in habit. It may be necessary to shorten limbs which outstrip their fellows in height or in lateral spread.

Meyer lemon trees grow more uniformly, but cling to a tiresome habit of growing strong horizontal branches in all directions through their centres. Left unpruned, they often produce tangled masses of crossing branches in a remarkably-short time. Fortunately, Meyer lemon trees will stand fairly-ruthless cutting out of such undesirable branches, but the work should be done annually to avoid the necessity for severe cutting at any one time. They are unlikely to require much other pruning.

Certain varieties of mandarin trees naturally produce very numerous and consequently weak and willowy branches. Annual thinning out of a few weaker branches encourages sturdier growth in those which are left.

Even spacing of a limited number of main limbs encourages development of a strong framework, capable of supporting sturdy fruiting branches and heavy crops of fruit. The centre of the tree should be kept free from large main limbs, which only fill up space that could be used more profitably by fruiting branches.

From the original 3 or 4 branches a tree should be encouraged to develop a main framework of about 8 principal limbs. Suitably-placed leading branches should be left to their own devices, whether or not they are in the form of single stems. It is the undesirable branches—those likely to overcrowd the head of the tree—which should be pruned. They should be removed or cut back to more or less horizontal laterals before they grow large. Selected branches will provide their own leading shoots, usually remarkably well placed. Though large limbs in the centre of a tree should be discouraged, the overhead canopy of leaves should remain essentially intact. It can be maintained by lateral growths from the principal branches.

Laterals which show signs of developing into strong branches crossing through the centre of a tree should be suppressed.

Excessively - vigorous upright branches, commonly known as water shoots, are usually cut out on sight, but that is not always necessary. Quite frequently they may be drawn downward and outward into positions where they can become useful fruiting branches. Occasionally they are useful to replace a broken branch, but if they are in unsuitable positions they should be suppressed before they grow large and difficult to handle.

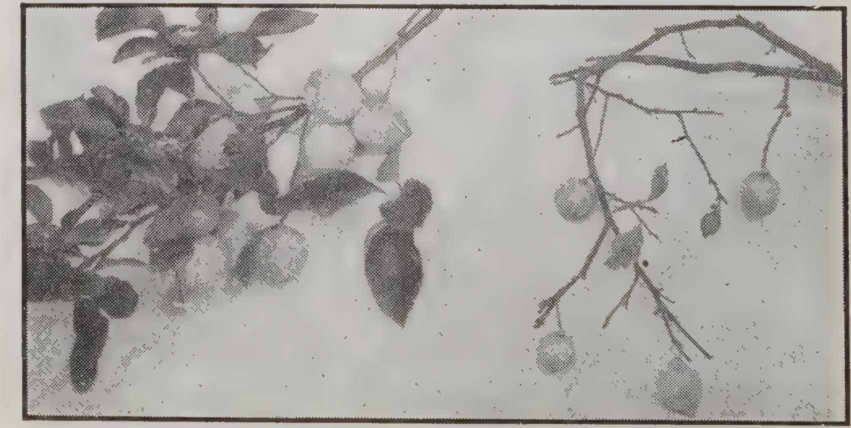
Not infrequently young citrus trees grow unevenly, with one or more limbs taller than the others. If the trees become extremely unbalanced, tall growths may be shortened, but usually the inequalities are unimportant, for citrus trees almost invariably regain symmetrical forms within a few years.

Very little thinning out of lateral branches is either necessary or desirable, but all growths arising from the trunks of the trees, and especially from their stocks, should be removed.

Young sweet orange and grapefruit trees require very little pruning except reasonable control of main limbs.

Developing Meyer lemon and certain varieties of mandarin trees usually require moderate thinning of lateral branches.

Lemon trees in their non-bearing years soon develop their distinctive, rather open and uneven style of growth. Some of their lateral branches may require shortening, for if permitted to grow too long they are



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Strong, healthy, fruiting wood on the left and a spent lateral on the right. Spent wood should be removed from trees.

inclined to become spindly and weak. It is easier and better to shorten the branches while they are young.

There should be very little diseased or dead wood in young trees, but if any is found it should be removed.

Bearing Trees Need Careful Treatment

From the time citrus trees begin to bear moderate crops until they reach the age of 14 or 15 years comparatively-little pruning should be necessary, provided they have been well trained in their earlier years. Formative pruning gradually gives way to what may be termed maintenance pruning.

The principal reasons for pruning treatment after citrus trees reach maturity are to encourage production of healthy fruiting wood by removing exhausted, diseased, or overcrowded branches; to keep lower limbs reasonably clear of the ground; to restrict the trees as nearly as possible to a height convenient for picking and spraying; and to confine lateral spreading of the trees within the limits imposed by the distances apart at which they were planted.

The ultimate objective, long-sustained production of heavy crops of fruit, cannot be obtained by pruning alone. Disease control, soil fertility, and cultivation must be maintained at a high standard. Pruning of bearing citrus trees is not worth the time it takes if the vitality of the trees is so low that they are unable to respond.

[Sparrow Industrial Pictures Ltd. photo.

Lemon trees from which the lower "skirts" of fruit-bearing wood have been removed. Such pruning is unnecessary and greatly reduces the fruit-carrying capacity of the trees.

It is suggested that pruning should be started at the bottoms of mature trees. Lateral branches within 18in. of the ground should be shortened or cut out. Occasionally large limbs, especially of lemon trees, are weighed down by heavy crops or crowded down by other branches until they must be removed. Next any dead or diseased branches should be cut out, but it is seldom profitable to attend to all the small dead twigs; they cause some scratching and marking of fruit, but are no worse offenders than any other parts of the trees. While working in the centres of the trees, thin out old and weak fruiting wood and any thorny water shoots not required to make fruiting branches. Leave all healthy young growths except those on the trunks and the lower parts of main limbs.

Attention should then be directed to the "skirts" or sides of the trees. A very large proportion of the best fruit is produced on the lower halves of the trees, so the side branches should not be trimmed high above the ground. When they are carrying fruit they may even touch the ground, but at pruning time they should be shortened until they are clear. Low branches are likely to be the first attacked by citrus brown rot, but that disease is so easily controlled by protective sprays that the point is of little importance. Strong branches should not be permitted to hang close to the ground, where they might be broken by cultivation implements, but light branches and fruit suffer very little injury.

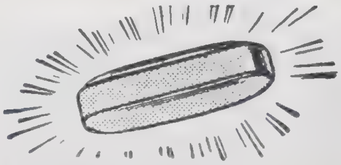
Excessively-long side branches should be shortened to sturdy side shoots, or may even be cut back to main limbs if they are in crowded positions. If lateral growths are rather crowded, a few of the weaker ones can be thinned out. Very little pruning of healthy growth will be found necessary except on lemon or mandarin trees.

Finally, attention should be directed to the tops of the trees. For spraying and picking, limitation of tree height has considerable merit, but carried to excess its advantages may be outweighed by the loss of fruit-bearing surface. However, the upper branches require some attention, for they are usually the first to show signs of debilitation as the trees grow older.

It is sound practice to thin out the top branches by removing some of the weaker growths without unduly opening up the trees. Light thinning leaves more room for the remaining branches to produce healthy wood and can be used to shorten back the taller branches. Leading branches must not be cut back to bare stubs but always to strong side growths or they will die back. Light annual thinning is much better than occasional heavy cutting.

[Sparrow Industrial Pictures Ltd. photo.

Healthy fruiting wood on the lower "skirt" of a lemon tree. If such branches are removed, a large proportion of the bearing surface of the tree is lost.



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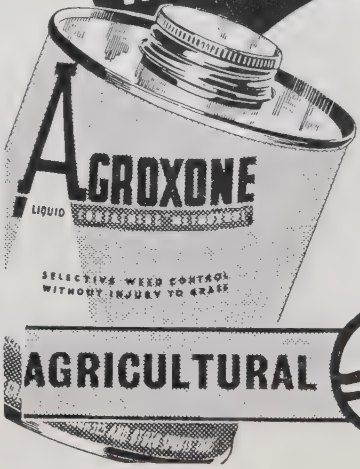
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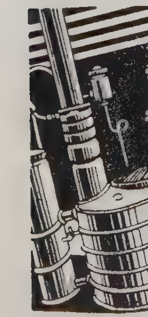

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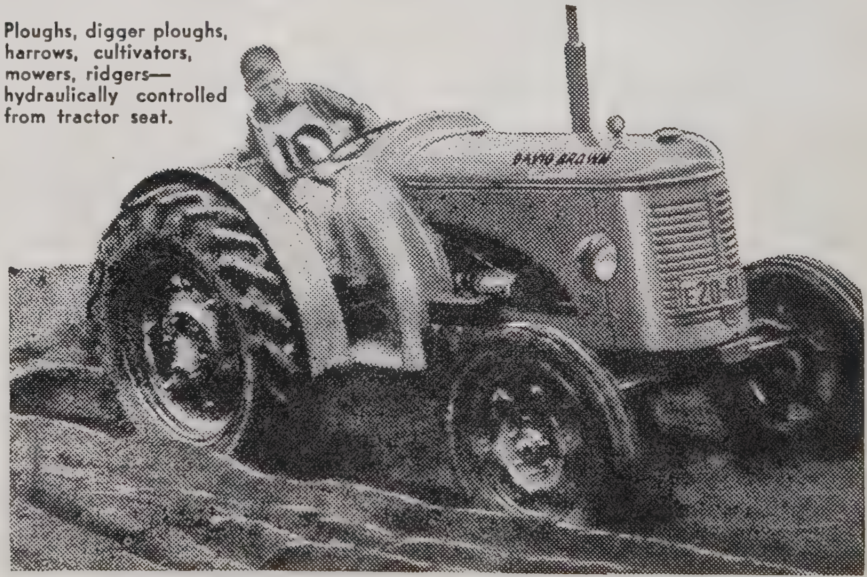

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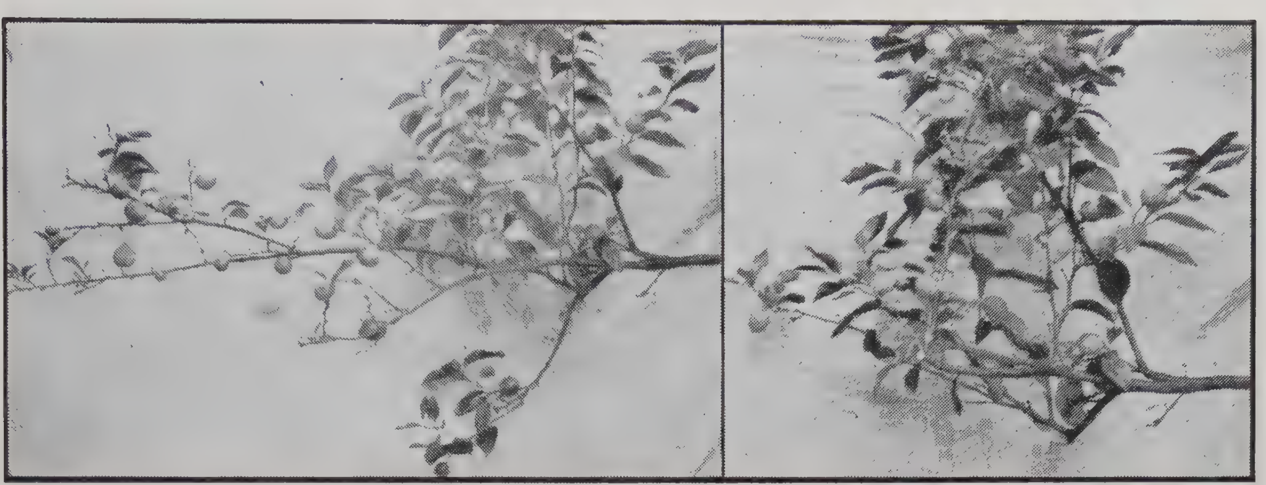
PRUNING OF CITRUS TREES



[*Sparrow Industrial Pictures Ltd. photos.*

Left—A long lateral of a lemon tree with unthrifty terminal growth which should be removed. Right—The same branch pruned back to strong, healthy wood.

Orange and New Zealand grapefruit trees require less pruning than do lemons and mandarins, but even they require some attention to keep their top branches vigorous. If the tops become debilitated, reinvigorating them is often difficult.

Careful checking of the trees for signs of bark diseases or borer injuries should be considered part of the pruning operations. Small diseased branches should be cut out, but larger limbs may often be saved by immediate suitable treatment.

Pruning instruments used for cutting diseased wood should be disinfected before being used again on healthy trees. Secateurs, saws, or knives may be immersed for 3 or 4 minutes in a solution of 1 part of commercial (40 per cent.) formalin to 50 parts of water. They should then be washed in clean water or wiped with a cloth. Strong solutions of proprietary disinfectants are satisfactory alternatives.

Semi-dwarf Trees

Considerable numbers of Meyer lemon trees, and some others, are grown on *Poncirus trifoliata* stocks, which tend to dwarf citrus trees of all kinds and to bring them into early and heavy production of fruit.

In their first few years trees of this type should be pruned in the same manner as are trees of the same kinds on stronger-growing stocks. Bearing trees require regular light thinning out of the weaker fruiting branches, but very little other pruning.

Meyer lemon trees on these stocks are inclined to grow into tangled masses of crossing branches. Reasonable thinning out of the worst offending branches is practically all the pruning they need.

Renovation of Debilitated Trees

When growers take over orchards which have suffered from malnutrition and neglect, they are faced with deciding whether to undertake renovation of the trees.

The age of the trees is the first consideration. In New Zealand the profitable life of a lemon tree usually ends between 30 and 40 years after planting. Oranges and New Zealand grapefruit will last very much longer. There are indications that trees on *P. trifoliata* stocks have shorter lives. Trees which have suffered a severe setback cannot be expected to last as long as those which have been more fortunate. If they are not too old—not more than 15 to 20 years in the case of lemons—the trees should repay the effort and expense of the pruning and other work needed to renovate them fully.

The next step is to inspect the trunks and main limbs very thoroughly for signs of bark diseases and borer attacks. If these lower principal members are unsound, the trees should be abandoned, for profitable trees cannot be built on poor foundations. Sound, healthy citrus trees, though temporarily weak and unthrifty, have remarkable powers of recuperation.

If renovation is to be undertaken, the trees should be supplied with generous quantities of fertilisers. For a normal application about 1lb. of fertiliser for each year of age of the trees, up to 15 to 20lb. for trees in full bearing, is a sound basis on which to work. Not less than these quantities should be applied to trees in need of renovation. Half the total quantity should be worked into the soil in September and the balance in March. The spring application should have a high nitrogen content, the following proportions being suggested: 4 parts of dried blood, 2 parts of bonedust or superphosphate, and 1 part of sulphate of potash. Blood and bone manure is recommended for the autumn application. The proportion of nitrogenous fertiliser may be reduced in subsequent years if growth responses are satisfactory. Cultivation and spraying must also receive attention. These matters must be attended to early, for pruning would be useless unless the trees were provided with the means to respond to treatment.

This is one of the few times when severe pruning of citrus trees is justified by the results which may be expected. The trees have become unfruitful and cannot be brought back to payable cropping for several years, whether they are pruned or not, so severe pruning is worth while with the object of giving them a new start by removing as much as possible of the weakened, worn-out, and ill-placed old wood.

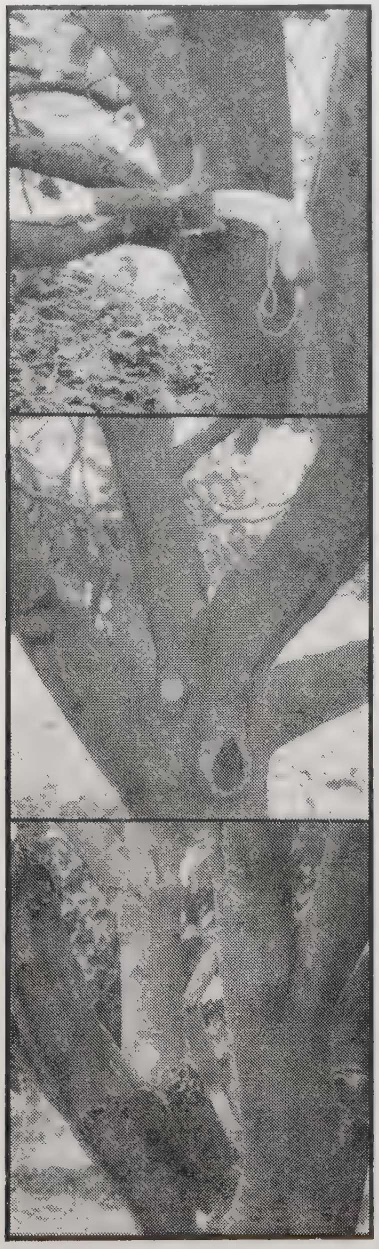
Because the cutting will be severe, the work must be carried out as early as possible in spring. If the work is done early, the spring flush of growth, and possibly an early-summer growth, will give the trees some measure of protection before hot, dry weather comes. Foliage should be well established by winter.

All diseased, dead, or weak branches should be cut out, and main branches should be shortened back to sound, healthy wood. The opportunity should be taken to remove badly-crossed branches and undesirably-placed main limbs. As much healthy foliage as can be left without unduly interfering with the pruning should be saved. All pruning cuts must be covered carefully with a wound dressing.

The trees may be expected to respond by throwing out very numerous and vigorous young shoots, but probably there will be some dying back of shortened branches. There must be no further pruning until the following spring, for the trees will need all their new growth to keep their roots healthy. Moderate thinning out of new growth and removal of any dead stubs should be undertaken a year after the original hard pruning and completed in spring of the second year.

Subsequent pruning treatment should be on similar lines to that described for normal trees. A light crop may be expected 3 years from the original pruning, and thereafter the quantities of fruit produced should increase steadily and fairly rapidly if the trees are well treated.

REMOVING BRANCHES FROM CITRUS TREES



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Upper—The method of sawing off a large branch without splitting the limb. The deep lower cut is made first, the outer cut on top severs the limb, and then the stub is sawn off neatly. Middle—In the centre of the trunk is a natural callus growing over a neatly-made pruning wound. On the left-hand branch is an untidy stub which cannot be covered by callus tissue. Lower—The result of leaving butts and stubs of branches. The one in the centre is borer-riddled and decayed.

There will be many wound dressings to inspect and renew from time to time.

Frost-damaged Trees

Fortunately, frost in New Zealand citrus-growing districts is seldom so severe that it causes appreciable injury to the trees, but occasionally that does happen and special pruning treatment becomes necessary.

After only slight frost injury pruning should be delayed for several months until the extent of the damage can be judged and new growth has become reasonably well established. Then the dead twigs and small branches should be cut back to sturdy new growths. Very little more pruning, except that which would be required on normal trees, will be necessary.

Should the trees have suffered more serious damage, causing death of larger branches, pruning is best left until at least 6 months after the damage occurred. Dead wood may then be removed, the limbs being cut back to points where strong new laterals have grown. No healthy foliage should be cut out at this stage. No further pruning should be undertaken until the following spring, when only moderate thinning out of new growths and removal of dead wood are advisable. The trees will require as much foliage as possible to help to restore their normal balance. Subsequent pruning should follow the system advised for renovation of debilitated trees.

Very young trees severely damaged by frost should be cut back 12 months later to a point where new growth has arisen from the main trunk above the bud union. Thereafter they should be treated as new trees. Any trees which have been killed back so far that new growth arises from a point very close to the ground are far better replaced.

The question of how much fertiliser to apply to seriously-frosted trees is of the utmost importance. Though the balance of the trees is upset, experience has proved conclusively that it can be restored much more quickly by normal feeding than by reducing the quantities of fertilisers.

Pruning Methods

Two simple but useful guiding principles may be applied to the pruning of citrus trees:

1. Cut out diseased, dead, or delibitated wood.
2. When hesitating over a healthy branch carrying good foliage, apply the rule "If in doubt, **don't** cut it out."

Large branches should be cut with a saw, not "haggled off" with secateurs. Secateurs will make a fairly large cut neatly and cleanly if the branch is bent gently to ease the cutting blade into the wood.

A cut to remove a branch should be almost parallel with the direction of the parent limb; butts and stubs should never be left. A mallet and chisel are handy for cutting out awkward stubs.

When no assistant is available to support large horizontal branches being sawn from the trees, the method illustrated on this page will obviate risks of splitting parent limbs. The lower cut is made first and as deep as possible before the saw jams; the outer cut, in the top, is made to sever the limb; and the stub is sawn off with a third cut.

Hobnailed or plated boots should not be worn by persons climbing trees; they cause bark injuries which frequently go unnoticed until they are invaded by diseases.

Care of Tree Wounds

Because citrus trees are subject to attacks by certain diseases and by borers, which frequently enter through injuries to the bark, the protection of all wounds as quickly and as effectively as possible is very important.

Young and vigorous trees readily produce callus tissue which slowly covers wounds by growing inward from their edges. In older or less vigorous citrus trees callus growth is very much slower. This natural healing process takes care of small injuries, but advances too slowly to protect large wounds.

Protective treatment of wounds, whether they be pruning cuts or injuries from other causes, is strongly recommended. The material used should be easy to apply, durable, not subject to cracking or flaking, and above all harmless to the trees. Bituminous paint has proved one of the most satisfactory dressings and is easily painted on to the wounds. A mixture of equal parts of coal tar and stockholm tar is almost as satisfactory, but coal tar used alone tends to check callus formation and sometimes to injure tree bark. A very heavy, greenish, crude grade of petroleum jelly is one of the best known wound dressings, but it has the disadvantage of being rather messy to apply. Lead paints are useful substitutes but lack durability, as they crack and flake off.

Wound dressings should be applied as soon as possible after the trees have been pruned. Small cuts require no treatment, but all with diameters greater than 1in. should be trimmed neatly and then painted carefully or smeared with a suitable material. Old wounds should be inspected at the same time and repainted if necessary.

Disposal of Prunings

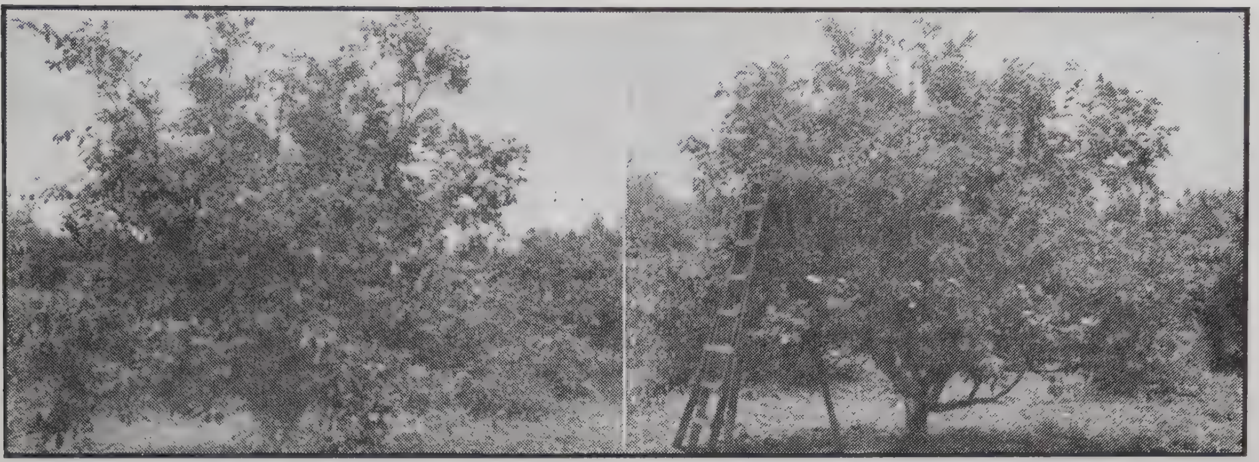
All diseased branches should be carted out of the orchard and burnt as soon as possible after they are removed from the trees.

Large limbs, and any smaller branches which are too hard to be cut up by cultivating implements, must also be carted away before they become a nuisance.

Smaller prunings from healthy trees can be worked into the soil when the land is cultivated.

Pruning Tools

Tools used to cut the very hard wood of citrus trees are subjected to hard usage and must be kept sharp to do the work efficiently. Only tools of the best quality will stand up to the demands which must be made on their durability and strength. Poor tools waste time.



[*Sparrow Industrial Pictures Ltd. photos.*

Left—A lemon tree with excessively-long top and side growths. Right—Pruning has reduced the height and spread of the tree considerably with little loss of valuable fruiting wood or foliage.

Secateurs: Easy-cutting, medium-weight types are preferred, and are quite satisfactory if saws are used for the heavier cutting.

Saws: The handiest and most popular type is that with a curved blade and teeth set to cut on the draw stroke. A pointed blade, about 12in. long and with only a slight curve, is the most satisfactory. The blade should be thin, of good springy quality, and with teeth well set for quick and easy cutting. Another useful saw is the bow type, with a renewable blade about 15in. long. The blade may be turned to any angle, to permit use of the saw in difficult places between branches.

Knives: Strong knives, with slightly-hooked blades, are the most serviceable for trimming saw cuts and other wounds.

Long-handled Shears: Double-purchase shears with handles 24in. long are very handy for quick cutting of fairly-thick branches. They are most useful when general renovation of trees involves severe pruning.

[*Sparrow Industrial Pictures Ltd. photo.*

An unthrifty lemon tree of bearing age which, though essentially sound and not too old, has been starved and neglected. It is not beyond repair, but needs cultivation and manuring as well as the pruning out of all weak or dead wood.

Ladders: Broad-based 3-legged ladders are the most generally useful. They must be strong and reliable but as light as possible. It is most important to keep them in thoroughly sound condition. Unreliable ladders are dangerous, and they waste more time than some people seem to realise.

Summary of Principles

The principal points to be kept in mind when pruning citrus trees are:

Prune the trees regularly, but as lightly as possible, and without unnecessarily interfering with their natural habits of growth.

Encourage the trees to grow well-formed, sturdy frameworks of limbs by judicious thinning out or shortening of less desirably-placed branches.

Keep the lower branches of bearing trees reasonably clear of the ground, but remember that they carry a large proportion of the crop where it is easy to pick.

Shorten excessively-long side or top branches.

Thin out weak or spent fruiting wood, especially from lemon trees, which require more pruning than do other kinds of citrus trees.

Cut out all diseased or dead limbs.

Do not prune out healthy branches carrying good foliage, unless there is a very good reason for doing so.

There is no evidence that healthy citrus trees derive any benefit from severe pruning, but it certainly reduces the quantity of fruit they produce.

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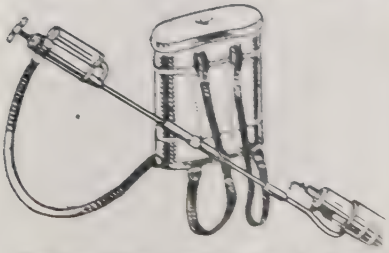

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Winter-feed Crops in North Otago

THE key to increased annual production from stock is the provision of extra feed during winter and early spring. The number of stock on any farm is limited to what can be safely carried during these periods and is not related to the number that could be carried during the summer months. This article by J. A. Graham, Fields Instructor, Department of Agriculture, Oamaru, deals with the practices adopted in North Otago for the provision of winter-feed crops and suggests methods of improvement.

THE soils of North Otago are mainly medium to good clay loams and, with the exception of the poorer hills of the Kakanui Range, they produce good cereal crops, particularly wheat, and fairly good pasture.

The climatic conditions generally are good, with long periods of bright sunshine, and are suitable for the type of farming adopted. The average yearly rainfall is 21 to 22in., which is sufficient, provided it is fairly well distributed throughout the year, but drought conditions sometimes prevail. The winters are usually comparatively mild, with frosty nights and good sunshine during the day, but periods of unsettled weather with cold winds and rain are usually experienced during the late winter and early spring.

Because of the climatic conditions and other factors such as grass-grub and porina caterpillar the life of pastures is comparatively short, and there are very few old, high-grade pastures such as those in many parts of the North Island and Southland. On the better-class land the life of pastures normally may be 5 to 6 years and on the lighter, shingly land as low as 2 years. Short-rotation farming is therefore practised throughout most of North Otago and cropping, together with fat lamb production, plays an important part in farm economy.

Dairying is not practised extensively and is mainly confined to the fertile Waiareka Valley and to the outskirts of Oamaru. The farmer normally establishes a certain cropping and pasture-renewal policy, and the growing of supplementary fattening and winter-feed crops is fitted into the general farming programme.

Growth of Pastures

Though dry conditions are frequently experienced, the recovery of pasture growth after rain is usually rapid. The autumn flush is usually obtained before early frosts retard growth, and sufficient accumulated pasture growth is available to carry stock through May and most of June. Occasionally this autumn flush is not obtained and the winter is entered with the paddocks in a very bare state, such as occurred in the 1947-48 season. Farmers then have to resort to growing additional areas of greenfeed cereal crops and this often means using areas intended for other crops.

During winter grass growth is retarded under normal North Otago conditions and in unfavourable seasons may be almost at a standstill. Spring growth is usually evident about the end of August or early September, but often pastures do not provide more than a green bite until early October, with a surplus during November and December. Lambing begins early in September and the calving of factory-supply dairy herds begins about mid-August, both preceding the spring flush of pasture growth.

Need for Supplementary Feeding

It is the aim of all progressive farmers to get as many lambs as possible away fat off the mothers with a minimum of mortality in both ewes and lambs. The greater the number of milk lambs the less is the need for supplementary fattening crops. For this purpose it is essential that the ewes be kept on a high plane of nutrition from the last 6 to 8 weeks of pregnancy right up to weaning time. It has been demonstrated in trials that ewes well fed during the latter part of pregnancy produce heavier lambs than poorly-fed ewes. The lambs are stronger, more vigorous, and more easily fattened. The ewes have higher milk yields and have a marked resistance to such complaints as pregnancy toxaemia, nutritional abortion, and milk fever.

HEADING PHOTOGRAPH: The Waiareka Valley with its rolling downs is typical of North Otago country. In the background are the foothills of the Kakanui Range.

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WINTER-FEED CROPS IN NORTH OTAGO

The basis of all feeding should be the provision of an adequate supply of fodder to meet the various requirements throughout the year. Ideally grassland should fulfil this requirement, but though it comes fairly close to that ideal in some regions of the North Island, in the South Island, particularly on the poorer country and in the higher altitudes, grass is largely a seasonal crop. If a farmer carried sufficient stock to utilise all the feed available during the spring flush, there would be insufficient feed available during the rest of the year, or if he based his stocking on the amount of pasture available during the winter, he would have an enormous wastage during the spring flush. However, by making hay of the surplus spring pasture growth and growing supplementary crops for periods of shortage he is able to strike a balance between the two and maintain a more uniform stocking.

Though the provision of supplementary feed is a feature of the farming practice of North Otago, there is still room for considerable improvement. A succession of mild winters may have given some farmers a false sense of security, but it is certain that many farmers do not make adequate provision for winter feeding of their stock. Last season, after a dry summer and autumn, the winter began with bare pastures, and the turnip and swede crops were poor or a total failure. The autumn-sown grasses, and especially those sown late or on a poorly-prepared seed-bed, were also backward. The chou moellier crops were reasonably good, and fortunately the autumn-sown cereal crops came away well. On many farms an area of hastily-sown oats and perhaps a small quantity of hay were the only feed available. Luckily, the winter turned out to be one of the mildest on record, and the stock wintered well, but if the winter had been hard, the feed supply on many farms would have been critical. The farmer cannot control Nature, but he can at least ensure that he has an adequate supply of hay on hand.

Swedes and turnips do not occupy the important position in North Otago that they hold further south, but both are grown. The most common practice is to rely on summer- or autumn-sown grasses and cereals with the addition of hay. The practice is unquestionably good and results in healthy stock, but too often the supply is insufficient or not properly utilised. The following table shows the acreages of the various feed crops grown in Waitaki County. Part of the area of oats grown for chaff is also fed off, as is some of the area grown for threshing, which is not shown in the table.

HAY, GREEN FODDER, AND ROOT CROPS GROWN IN WAITAKI COUNTY IN 1946-47

	acres
Grass and clover cut for hay	3,175
Grass and clover cut for silage	75
Oats for chaff, hay, or silage	2,122
Lucerne cut for hay or silage	3,104
Rape	10,686
Chou moellier and kale ..	2,508
Swedes	1,336
Turnips	2,855
Turnips and rape (mixed) ..	282
Mangolds	331

Though North Otago conditions are suitable for both the growing and feeding off of greenfeed cereal crops, growth is often allowed to become too rank before crops are fed off.

Hay

The disposal of surplus spring pasture growth is not the problem in North Otago that it is in the higher-rainfall areas, as it is shut up for either hay or a grass seed crop. Though the acreage of pasture hay fluctuates from season to season, the area shut up in the district has been smaller in recent years. This reduction can be ascribed partly to the increased area utilised for grass and clover seed production, but has been offset somewhat by the increased amount of lucerne hay produced. The North Otago climate is eminently suited to the production of well-cured, good-quality hay and it is undoubtedly the best standby the farmer can have for fodder. It can be fed to all classes of stock in periods of drought as well as during the winter and can be fed alone or in conjunction with greenfeed or root crops. With the use of the pick-up baler the making of good hay is not the problem it used to be and larger areas of pasture might well be set aside for hay.

Lucerne

Lucerne thrives best where the summer is warm and early and under conditions of low to medium rainfall. Except in some of the country south of Maheno, which has an impervious subsoil, and some of the light, thin, shingly soil of the Steward Settlement, North Otago conditions are very suitable for its growth. Some farmers consider that lucerne is difficult to grow, but provided attention is given to the well-known factors associated with a good establishment, the risk of failure is not great. In 1946-47 Waitaki County, with more than 3000 acres, had the greatest area of lucerne cut for hay or silage in the Dominion. There are few farms in North Otago where lucerne could not be grown to advantage and the total area in this district could well be extended to 10,000 acres.

Lucerne has been aptly described as the "king of fodder crops." In North Otago it has certain advantages over permanent pasture both as a hay crop and a greenfeed crop. It comes away early in the spring and produces good grazing at a time when pastures are usually backward. Being moderately drought resistant, it will often provide green forage when other grasses and clovers have dried off in the summer. It is a more permanent crop than pasture and when properly cared for a stand will last for many years. Stands of 10 or more years old are not uncommon.

On established areas three to four cuts a season with a yield of 4 to 6 tons of hay are usual, which compares more than favourably with the 2 to 3 tons obtained from pasture. Lucerne hay is more palatable than pasture hay, is richer in protein, and has a considerably higher lime and phosphate content. As breeding stock require these constituents to a high degree during pregnancy, and as root crops and greenfeed oats are notably deficient in them, lucerne becomes invaluable for feeding either on its own or in conjunction with these crops.

Though the lucerne plant is not considered to be adapted for grazing, and indiscriminate grazing undoubtedly shortens the life of a stand, lucerne could play a far more important part as a grazing crop than it does today. It can be treated as a temporary hay crop and be grazed during the difficult spring months and then be shut up to produce a crop of hay. By subdividing an area it could be rotationally grazed

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Provided the necessary attention is given to lucerne, the risk of its failure in North Otago is not great.

and this would allow the plants to recover from grazing. If a certain length of leaf is maintained and injury to the crown avoided, a partially-grazed stand should last for many years. Even if the life of a stand is shortened by grazing, it is still a worth-while practice. Lucerne should not be grazed late in the autumn, as it is advisable to leave some of the autumn growth to protect the plants from frosts during the winter, which results in earlier spring growth.

Greenfeed Crops

Greenfeed is a very convenient means of providing succulent, nutritious fodder for periods of shortage. Temporary pastures and greenfeed cereal crops sown in the late summer or early autumn are widely grown to provide winter feed. North Otago conditions are very suitable for both the growing and feeding off of these crops and good results are obtained. Sheep fed on greenfeed come through the winter in a healthy condition and soil fertility is built up as a result of the stock droppings. Short-rotation ryegrass, Italian ryegrass, and green oats are the most popular crops and Black Skinless barley, Cape barley, and ryecorn are grown to a less extent. The grasses produce feed of a much higher quality than that of the cereals and especially are higher in the protein so necessary for in-lamb and milking ewes. The cereals are also lower in minerals, but these deficiencies can be largely balanced by feeding off in conjunction with good-quality hay, particularly lucerne, or a good run-off on grass.

Temporary Pastures

Short-rotation ryegrass: This comparatively-new ryegrass has given good results in North Otago as an out-of-season feed producer, particularly in its first season of growth. It is widely grown and is extensively utilised as a greenfeed crop; in fact, it has largely replaced Italian ryegrass for this purpose. Its ability to establish itself quickly, to produce good autumn, winter, and spring feed, and its quick recovery after grazing make it an invaluable greenfeed crop. It appears to have most of the virtues of Italian ryegrass and in addition it produces more summer feed and is more persistent. Short-rotation ryegrass requires fairly high conditions of fertility and unfortunately on some of the lighter soils its virtues of persistency have not been realised. There have been some disappointments with its performance after the first year, but often these have been the result of failure to sow clover with the grass or to apply lime and fertiliser. Some farmers are now making a practice of sowing an area of this grass each year to provide winter feed, a practice which could well be extended.

Italian ryegrass: This is another very useful producer of winter feed, but it is not as extensively grown now as formerly, chiefly because of its lack of persistency. It produces slightly more winter feed than short-rotation ryegrass, but not as much summer feed. For winter feeding the best results are obtained with both of these grasses if they are sown in January or early February on a seed-bed which has been fallowed for some time. Unless a seed crop is required, it is advisable to sow cowgrass or Montgomery red clover with these grasses.

After producing good grazing the paddocks can be shut up to produce a crop of hay, and if they are then spelled, the clover will come away to provide good late-summer grazing. Short-rotation ryegrass has also given good results as a lamb fattener when sown down with rape in the spring.

Greenfeed Cereal Crops

Green oats are a valuable winter forage crop and when sown in the late summer or early autumn will provide a succession of feed from late autumn until September. After providing feed the crop is frequently shut up for chaff or grain. The most popular feed varieties are Algerian and Duns, the former being more extensively grown. Algerian tillers well, will stand close grazing, and recovers well after grazing. It is rust resistant and is probably the most drought resistant of any variety. Duns is slower growing than Algerian, but can be fed off later in the spring and is therefore more popular in late localities. Some farmers prefer an oat that will provide good feed and also be satisfactory for milling. Achilles, though it has not been extensively grown in the district, has given good results for this dual purpose and is likely to become more popular.

Lucerne is a more permanent crop than pasture and could play a far more important part in the provision of grazing.

WINTER-FEED CROPS IN NORTH OTAGO

Chou moellier does well in North Otago and is especially popular with dairy farmers because of the large amount of succulent feed it produces.

Greenfeed barley is not extensively grown, but is sometimes grown to provide early-winter feed, especially when the season has been dry and the pastures are bare. Black Skinless is the variety most commonly grown for this purpose, as it produces a good bulk of feed quickly. It is more palatable, produces more feed, and recovers better after grazing than Cape barley, but it is not very suitable for late-winter feeding because it runs to stalk quickly. The Cape variety has slower initial growth, but it can be grazed later in the winter.

Chou Moellier

Chou moellier does well in North Otago and is gradually gaining popularity. It is more widely grown than swedes, and is especially popular with dairy farmers. Its greater use can be attributed to the large amount of succulent feed it produces and its recuperative powers after attacks of disease and insect pests. It does best when sown in paddocks out of lea, and, being a gross feeder, responds well to heavy manuring.

Root Crops

The acreage of the swede crop, which has never been as important as it is further south, is decreasing. The climate is not particularly suited to the growing of swedes, as they thrive best in a cool, moist climate, but when conditions are suitable good crops can be obtained. Even in dry seasons fairly good crops can be produced, provided they are sown in a paddock of good fertility, the cultivation is good, and fertiliser is applied fairly liberally. The most popular varieties are Superlative and Grandmaster, but in trials conducted in the district by the Department of Agriculture the new variety Calders has given promising results. Large-scale trials are being carried out with this variety this season, and seed will be available commercially for 1949 sowings.

White-fleshed turnips occupy a larger acreage than swedes, but are not widely grown and are mainly confined to the southern part of the district, the foothill country, and some of the lighter land near the Waitaki River. Turnips have a much lower feeding value than is generally realised and should always be supplemented by good-quality hay, chaff, or a good run-off on pasture. Turnips do well on turfy country and are an invaluable first crop after ground has been ploughed out of browntop or tussock.

Conserved Pasture

It is a good policy to reserve some of the autumn grass growth for winter feeding. Autumn-conserved grass has a fairly high feed value and is equal to good hay. After mating, the ewe flock can be concentrated on a few paddocks and the remainder of the grass paddocks left unstocked until July or August.

Winter spelling of pastures also promotes earlier spring growth, because the grass benefits from going through most of the winter with plenty of cover to the crowns of the plants.

Another method of providing feed for winter and early spring is to encourage out-of-season pasture growth by autumn topdressing, and in this respect the South Island lags behind the North. This should be done before grass growth ceases in the autumn, preferably in February or March.

Weakness in Utilisation

There is no doubt that feed crops are often poorly utilised in North Otago. Far too often stock are given the run of a whole paddock of greenfeed and when the paddock has been grazed they are turned on to a bare pasture until the greenfeed has recovered sufficiently for a further grazing. This results in a check to the stock and is one of the most common causes of troubles in ewes. It is generally agreed that optimum results are obtained when areas are fed off in breaks and supplemented with hay and a run-off to pasture. It ensures a continuity of supply and eliminates checks to the stock. Other common faults are either allowing greenfeed to grow too rank before grazing or prolonging close grazing, which results in injury to the plants.

Recommendations

Too much stress cannot be laid on the necessity for adequate winter-feed supplies. It is better to come through the winter with a surplus than to be short at critical periods, which inevitably occur every few years.

The recommendations of this article may be summarised as follows:—

1. A greater reserve of hay should be built up and carried.
2. Greater use should be made of lucerne both for hay and to provide discriminate grazing during periods of shortage.
3. Each year a paddock of short-rotation ryegrass or Italian ryegrass and red clover should be sown to provide winter and early-spring feed together with a crop of hay.
4. Oats should be sown early in the autumn to provide winter greenfeed and should be supplemented with some hay.
5. Greenfeed crops should be fed off in breaks.
6. Swedes can be successfully grown in the district, but require well-cultivated ground and fairly high conditions of fertility.
7. Turnips are a good crop for poorer country, but do not constitute a balanced ration and should always be supplemented by hay or chaff.
8. When possible some grass paddocks should be shut up during the winter to provide feed for early spring.
9. Out-of-season pasture growth should be encouraged by topdressing early in the autumn.

RADIO BROADCASTS

RADIO talks to farmers will be given from Station 1YA Auckland at 7.15 p.m. on the following dates:—

May 4—"Current Farming Problems," by G. L. Banfield, Instructor in Agriculture, Department of Agriculture, Thames, and A. V. Allo, Instructor in Agriculture, Department of Agriculture, Tauranga.

May 11—"Faults in Wool," by D. G. Austin, Sheep and Wool Instructor, Department of Agriculture, Auckland.

May 18—"Beekeeping in Many Lands," by R. S. Walsh, Apiary Instructor, Department of Agriculture, Auckland.

May 25—Young Farmers' Clubs session, by Whangarei District Committee.

Other talks are given from 1YA Auckland on Tuesdays at 12.35 p.m., 2YA Wellington on Thursdays at 12.35 p.m., and 3YA Christchurch on Mondays at 12.20 p.m.

THE HISTORY AND EVOLUTION OF SHEEP BREEDS

1. The Merino in Europe and Australia

By I. S. MILLER, Sheep and Wool Instructor,
Department of Agriculture, Christchurch.

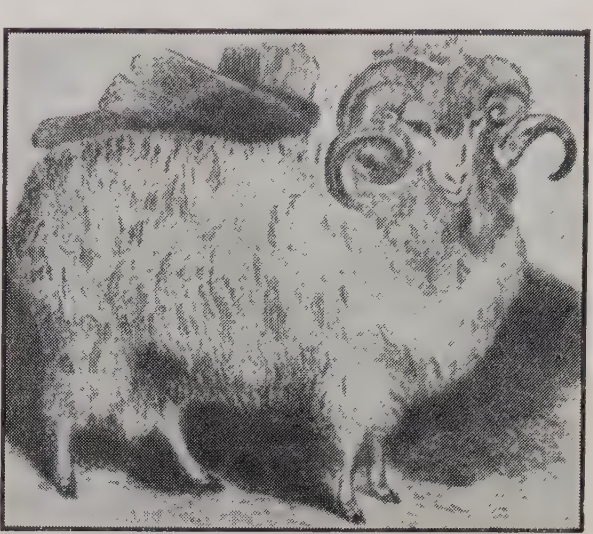
THE sheep, which is a commonplace object on New Zealand farms today, is the result of a long process of evolution, only part of which has occurred in this country. The background of the history of New Zealand sheep is to be found in Europe and Australia as regards the Merino, the most important sheep in New Zealand until the 1880's, and in Great Britain as regards all sheep other than the Merino. This article is the first of a series on the history and evolution of sheep breeds which should prove informative to those interested in New Zealand's sheep and wool industry. Subsequent articles will deal with the sheep breeds of Great Britain and the introduction and evolution of sheep breeds under New Zealand conditions.

IN tracing the origin and development of New Zealand's sheep population, which in 1947 was 32,681,799, the writer has drawn freely from authorities on the subject, and is indebted to a number of people who have supplied information, written material, and photographs.

The sheep has supplied two of the basic necessities for mankind from time immemorial; the raising of sheep for their wool has also usually been one of the first industries to be established in newly-developed countries.

International statistics for sheep and wool are notoriously unreliable, due to such reasons as lack of regular collection and time lag in publication, but in the tables on this page the relative importance of the main wool-producing countries of the world is shown. New Zealand ranks seventh in the list for the number of sheep and third as a wool producer. (New Zealand is also third as an exporter of wool.)

It was estimated that in 1938-39 there were 755,400,000 sheep in the world. Of these, almost half were non-woolled or bore very light fleeces. The total world wool production was 3,990,500,000lb., the average fleece weight being only 5.3lb. a head. It was estimated that of the total world wool production in 1943 approximately 38 per cent. was of Merino type, 43 per cent. of crossbred type, and the remaining 19 per cent. of carpet wool.



[*After H. B. Austin, "The Merino, Past, Present, and Future."*
The old Spanish type of Merino. The evolution of the breed is evident if a comparison is made with the modern counterpart below.

[*Green and Hahn Ltd. photo.*

SHEEP NUMBERS, 1946

(Preliminary estimates from the FAO publication "World Fibre Survey")

Country	No. 000,000	Country	No. 000,000
Australia	93.4	South Africa	35.0
Russia	72.0	New Zealand	33.0
Argentina	53.0	Uruguay	25.0
India	48.0	United Kingdom	20.4
U.S.A.	42.4	Spain	20.2

WOOL PRODUCTION 1946-47

(Preliminary estimates from "Foreign Crops and Markets," December, 1947.)

Country	Weight in lb. 000,000	Country	Weight in lb. 000,000
Australia	980	South Africa	200
Argentina	495	Uruguay	168
New Zealand	360	Spain	77
U.S.A.	308	United Kingdom	70
Russia	270		

Origins Lost in Antiquity

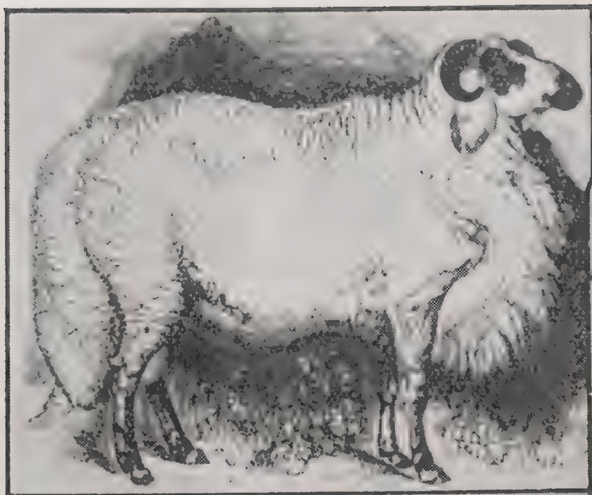
The question might naturally be asked, "Where have these sheep come from?" The origin of the diverse races of sheep is lost in antiquity. Certain facts are available, certain theories appear reasonably sound, and there is a good deal of conjecture. The men of the neolithic age appear to have migrated into Europe from the south-east, from the neighbourhood of Afghanistan in Central Asia, the great birthplace of mankind. From this centre, with the migrations of mankind, the sheep spread in every direction.

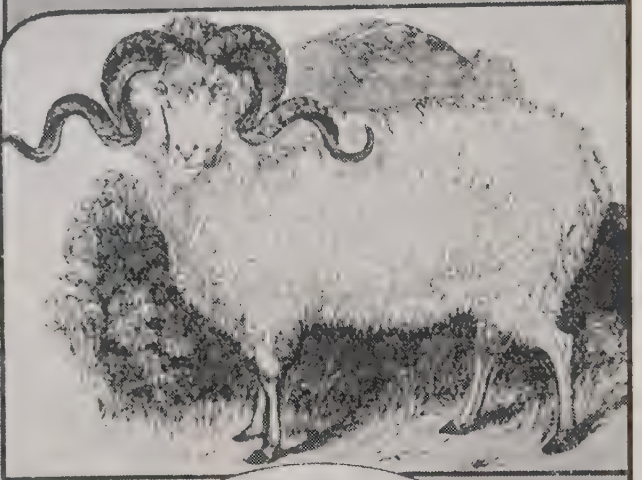
According to Osburne's "History of the Egyptians," "flocks and herds were possessions in those remote ages for which Egypt was always celebrated." The wool of ancient Egypt is described as short and coarse, but the Egyptians must have had fine wool from somewhere to weave their robes of rich and graceful pattern.

In ancient Assyria and Babylonia woollen garments were in much more general use than in Egypt and people of those countries also had robes woven with extreme beauty and intricacy. They appear, too, to have understood thoroughly the rearing and breeding of sheep as well as other stock.

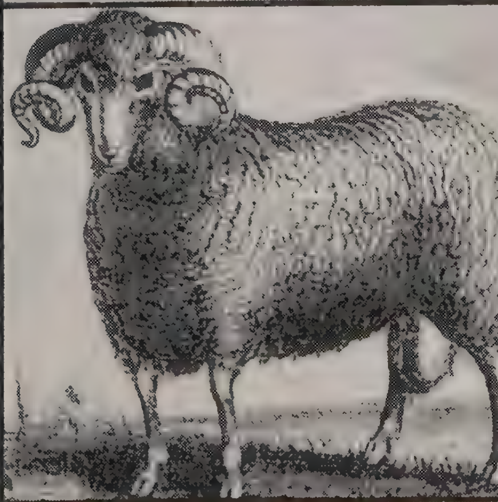
EVOLUTION OF SHEEP BREEDS:

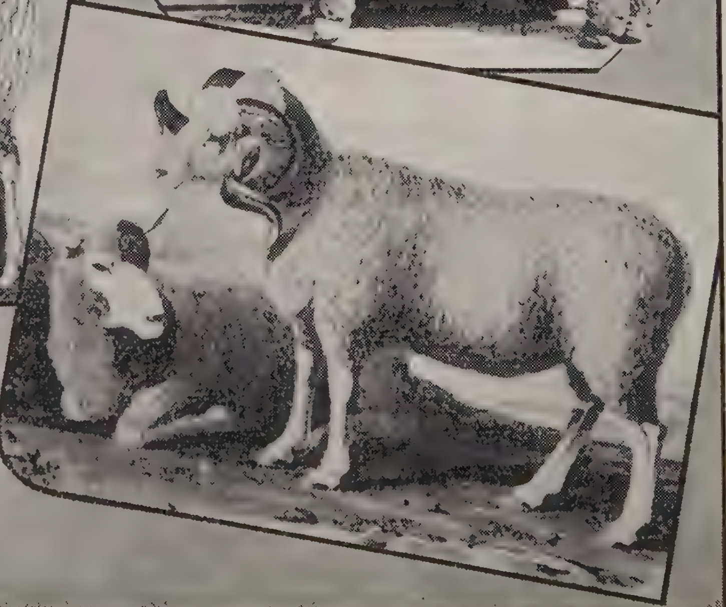
THE MERINO





Above—The fat-tailed sheep of India and the Cape. Top right—A Saxony Merino ram brought to England from Saxony by Lord Western about 1810. In circle—The Owl, a Gadegast ram, was one of the more famous Saxon rams and champion at the best shows in Europe. (Photograph taken in 1869.) The Merinos in Saxony, and more especially in Silesia, seem to have improved for 40 or 50 years after 1820. Steiger, Fischer, and Gadegast were the most famous breeders.





Above—A Merino ram of Lord Western's flock about 1840. Right—An old Spanish type of Merino. Small, slab-sided, narrow-chested, and cutting a fine, light fleece, the Spanish Merino was probably well suited to the conditions of constant travelling, from 8 to 10 miles per day, often on the barest of feed.

[Photographs after E. W. Cox, "The Evolution of the Australian Merino," and H. B. Austin, "The Merino, Past, Present, and Future."

Of all the peoples of antiquity, however, the Phoenicians (about 1000 B.C.) were the most successful sheep breeders. Their wool was celebrated for its fine quality and all their permanent colonies on the shores of the Mediterranean became celebrated for their fine-woolled sheep. They must be given the credit for introducing fine-woolled sheep into Europe.

It is apparent from Biblical writings that immense numbers of sheep and cattle must have been owned by the people of Asia Minor, which appears almost incredible when the desert-like aspect of much of the country today is considered; but this desolation did not always exist. The Hebrews, however, cared little for breeding quality stock, nor did they attempt improvement by introductions from the surrounding countries.

From the many references in Greek mythology to sheep it is evident that the Greeks had a general and familiar knowledge of pastoral life, while the main principles of stock breeding were well understood and husbandry was considered an occupation worthy of the noblest in the land. According to one writer the Greeks held the sheep in great honour and were so particular in their husbandry that the sheep were covered with skins or cloths to soften and beautify the wool. This writer was also of the opinion that sheep breeders imported rams from Colchis at great cost and that the expedition of the Argonauts in search of the Golden Fleece had for its object the importation of the finest animals of which they knew. The Greeks introduced fine-woolled sheep into their colonies in Italy and Spain, and for many centuries after the Romans called the fine-woolled sheep of Apulia Greek sheep.

The cultivation of these animals, commenced in Asia Minor and Greece, was carried still further by the Romans, but they apparently rendered them extremely delicate by pampering, for the sheep, instead of being grazed in the open fields, were housed almost the year round. In the disastrous times which followed the disruption of the Roman Empire the fine-woolled sheep of Italy and the East disappeared almost entirely, due to the neglect and hardship to which they were subjected, or they degenerated by being mixed with inferior sheep.

Fine-woolled Sheep in Spain

This race of sheep was preserved in the south-west corner of Europe, however. Whether the Greeks were responsible for the first introduction of fine-woolled sheep into Spain or not, the Phoenicians and Carthaginians had a monopoly of the trade with Spain many centuries before the Greeks appeared on the coast. Under Carthaginian rule Spain became famous throughout the countries bordering the Mediterranean for the excellence of its woollen cloths; the people were not merely traders, but paid great attention to agriculture and the breeding and rearing of stock.

The Romans, after their long and arduous conquest of Spain, settled there in large numbers, principally in Baeticia, and practised the same mode of agriculture and stock breeding and rearing that had been so long and successfully carried on by the Carthaginians. Spain then enjoyed a period of peace and prosperity until the country was given over to chaos during the inroads of the barbarians.

After this period of about 300 years the Moors were the next conquerors of Spain, and they resumed the long-neglected agricultural development of the country.

The practice of "transhumania" is recorded as having first been carried on with certain of the Spanish flocks at about this time. Under this custom, which will be more fully referred to later, the "transhumantes" or travelling sheep were driven back and forward from the high country in the north to the plains of Estramadura.

In spite of the era of disruption following the fall of Roman power, this practice of "transhumania" enabled a hardy breed of sheep to survive, and during the long rule of the Moors from the 8th to the 15th centuries the standard of the fine-woolled sheep of Spain was brought to its former height, if not surpassed.

The Moors were skilful breeders of stock and under their care the fine-woolled sheep numbered 7 millions, but by the neglect and bad management of the Christians they became so reduced that in the reign of Philip IV there were only 2½ millions of fine-woolled sheep in Spain. (It should be noted that Ferdinand, the Christian conqueror of Spain, took Seville in 1248.) Under the drive of the church authorities the Christians were obsessed with the aim of ridding the country of all the arts and sciences of the Moors. The population was greatly reduced by death and by either voluntary or forced exile, and their famous manufactures almost disappeared. It is therefore not surprising that breeding and rearing of the famous sheep of the country were greatly neglected.

Merinos Jealously Guarded

At what stage the fine-woolled sheep became known as Merinos is very doubtful, as is also the origin of the term. Some writers have claimed that Merinos were introduced into England from Spain in the 14th and 16th centuries, but this is not authenticated. If they were, they quickly died out or were absorbed within the breeds indigenous to the country. In more recent times—in the 17th and early 18th centuries—the Merinos were jealously guarded by the Crown of Spain. The wool was a great source of income, being worth nearly £2 million a year to the small band of aristocrats who controlled the flocks, and the laws against exportation of sheep from the country were ruthlessly enforced.

Over a period of centuries a prejudice had so grown in the popular mind that a most extraordinary code of regulations had been drawn up for the government of the "transhumantes" or migratory flocks. It was believed that this annual droving of the sheep backward and forward from the high country in the north to the plains was necessary to keep them in an even temperature for the production of fine wool. (This theory was later exploded by the breeders of Merinos in Saxony, who improved upon the quality and fineness of the best Spanish fleeces by very intensive husbandry.)

Very extensive privileges were granted the Mesta (or council for the management of the travelling flocks) and the directors and shepherds of the flocks eventually carried out this powerful monopoly very despotically. The sheep passed unmolested over the pastures of the villages and commons lying in their route and had the right to feed on them. Proprietors of cultivated lands were obliged to leave a path 84yds. wide, and still these lands were subject to continual trespass by the migrating flocks. Naturally, with this continual movement, the death-rate, especially during lambing, was very high. Further, weak lambs were either killed or given away to farmers on the route.

Actually there were two great groups of sheep in Spain—the migrating group called transhumantes and the stationary group called estantes. The estantes stayed on the farms and differed from the transhumantes in that they were larger, with coarser wool. In 1779 it was estimated that there were 10 million transhumantes. There was also a coarse-woolled native sheep of very inferior quality called the chunah, of which some writers speak as one of the most worthless animals in Europe.

The Spaniards made little attempt at improving the Merino breed by selection, but it is probably because of their continuation of the age-old customs of the country that the purity of the Merino sheep was maintained as they received it from the Arabs. In any case the Spanish Merino type, small, slab-sided, narrow-chested, and cutting a fine, light fleece, was very probably well suited to the conditions which were imposed upon it—those of constant travelling at from 8 to 10 miles per day, often on the barest of feed.

Main Merino Strains

There were various families of the Merino in Spain, but the strains which follow are those which became famous in the development of the sheep and wool industry of other countries.

E. W. Cox, in "The Evolution of the Australian Merino," says that the largest and one of the three best families of Merino in Spain was the Paular, so named after the Carthusian monks of Paular who originally owned it. This was considered one of the most handsome types and the wool was described as soft, silky, close, and compact.

The foremost family as regards quality was the Royal flock, the Escurial, belonging to the King of Spain. They were much the same size as the Paular, but of lighter build. The wool of the Escurials was supposed to be less dense, but of better quality and beautifully crimped.

The Negrette, called after Count Negrette, who owned the strain, was the largest and strongest of the migrating sheep of Spain. The wool was shorter and the sheep were loose skinned, while the rams were large horned and woolled on the face and right to the hoof.

The Infantado, another of the top-ranking strains, belonged to the Duke of Infantado and differed from the other strains in that the rams' horns were very close to the head.

The Guadalupe family was supposed to be heavier boned than the Negrette, and just as large framed. In addition, it was famous for both the quality and quantity of its wool, which was dense, well crimped, but more oily than that of the Negrette.

There were other well-known families of the Merino, but those mentioned were easily the most outstanding. It was the blood from them which founded the great Merino flocks of the world, developed since the first exportation of the blood was allowed.

Saxony Importations Began New Era

Though Merinos went to many countries in Europe, the breed was kept pure and improved only in Saxony, Germany, Austria, Hungary, England, and France. Introductions to other countries were entirely absorbed within the existing breeds.

Sweden was actually the first officially to import the Merino in 1723, but Saxony first realised the very great importance of the breed. With the importation of the Merino into that country in 1765 a new era in the sheep and wool industry of the world was begun.

Whether or not reports are correct that there was a fine-woolled sheep of good quality in Saxony introduced by the Romans, Cox says that it is certain that they were very inferior to the Spanish introductions.

Prince Xavier, who was the administrator of the Electorate of Saxony during the minority of the Elector, seems to have been a man of some foresight. Driven by economic necessity to restore the resources of the country after the Seven Years War, he decided to see what could be done with the Spanish Merino in building up the wool industry. The King of Spain was a cousin of the Elector and the Prince no doubt used this relationship as a lever to good effect, as his appeal resulted in a gift of 300 of the best of the Escurial flock.

The King of Spain directed the mayoral (controllers of the royal flock) to select and export only the very best Merinos to Saxony. As the penalty for failure to do this was 15 years' imprisonment, the foundation stock of the Saxony Merino was of the best from the start. There arrived at Dresden in July, 1765, 92 rams and 128 ewes; a few of them were distributed among the nobility, but the main flock was kept intact.

Every care was bestowed on the sheep and the Elector of Saxony, to ensure the breakdown of any existing prejudice against the foreigners, issued a decree that unless all farmers used Spanish rams to improve existing flocks they would be evicted from their farms. This rather autocratic measure shows how resolved the Elector and his associates were to share in the revenue to be reaped from the Merinos of Spain.

The introduction of the Merino to Saxony proved so successful that in 1774 another 300 (100 rams and 200 ewes) were procured from Spain. These were not as outstanding as the first draft, but still of excellent quality, and the industry in Saxony went from strength to strength. According to McIvor, by 1802, of the 16,000,000 sheep on the German side of the Rhine, there were 4,000,000 "pure-bred" Merinos of Spanish blood in the studs of Saxony.

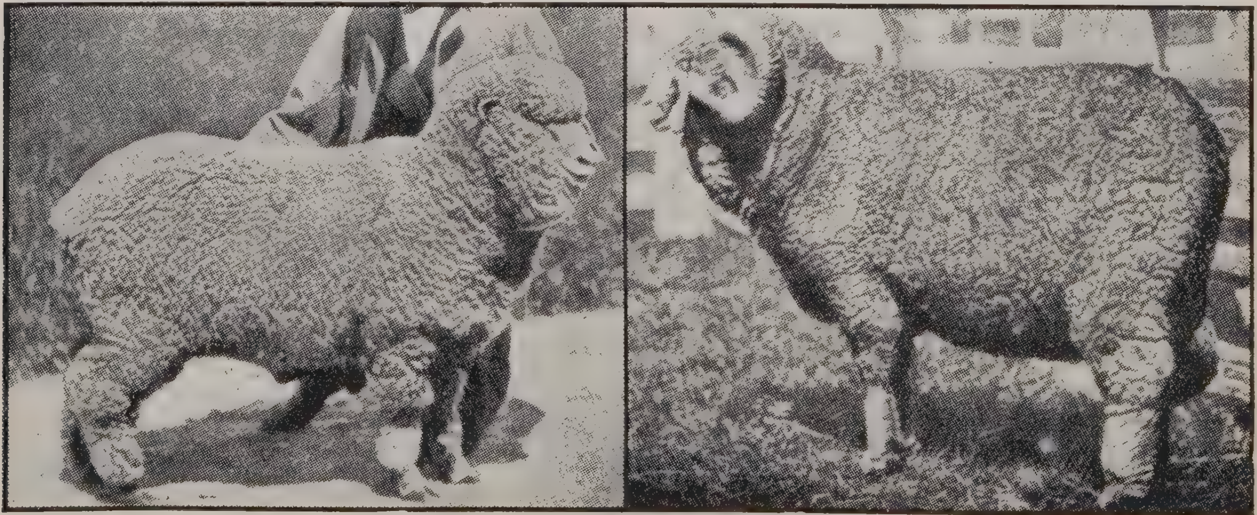
Definite Saxony Type

The Saxon farmers used every care in the breeding and selection of these animals and culled heavily. Their endeavours rapidly resulted in a definite Saxony type. However, it is said that their breeding methods, apart from the rather extreme pampering to which the sheep were subjected, produced the very best quality wool at the expense of frame and constitution. The wool is described as "fine, even, dense, and lustrous" and became more sought after by wool buyers than the original Spanish, for at this time it was recognised as the best in the world. The principality, too, soon derived a considerable income from the export of fine-woolled stud sheep. In later years the Saxon breeders did their utmost to improve on these characteristics of their wool and fixed a definite type. Besides importations from the royal flock or Escurial, most introduced blood was of the Negrette, though there was some Infantado. By 1810, 15,000 pure-bred Merinos had been distributed among private breeders.

Introductions Elsewhere in Europe

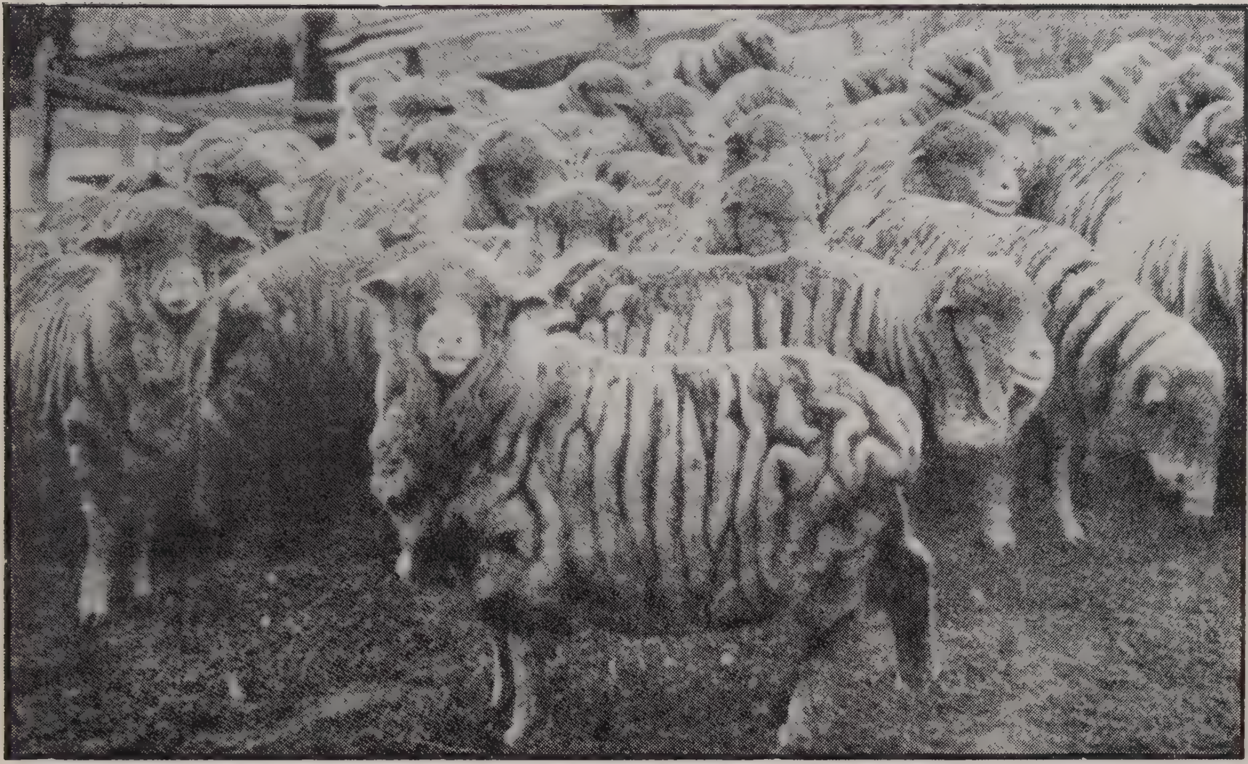
Other countries quickly followed the example of Saxony, Prussia being the first, Von Vinke introducing Spanish Merinos in 1768. Frederick the Great then imported 100 rams and 300 ewes. There appears to have been carelessness and mismanagement, for most of these died and Von Vinke was then commissioned to purchase 1000 more.

In Silesia a type rather different from the Saxony was developed as a result of a big importation of Negrettes and Infantados in 1811. The Silesian type and that resulting from Von Vinke's introductions were interbred and a new type was fixed, principally in the famous stud of Fischer of Wirchenblatt. This, according to Cox, is the description of the type toward the end of the 19th century: "Good quality, bright wool, 2 to 3in. long, with a clear white yolk; good frames, averaging about 120lb. live weight for ewes and 150lb. for rams; dark tipped and cutting about 9lb. for ewes and 14lb. for rams." The live weights of the Fischer type should be compared with those estimated for the principal Spanish flocks by a French writer in the early 19th century: "The average



[Photographs after H. B. Austin, "The Merino, Past, Present, and Future."

Left—A ewe of the Scone stud in 1870. William Gibson owned the Scone stud, which eventually became the most famous in Australia. Robert Gibson, William's brother, owned the Bellevue stud, in which was the famous ram Sir Thomas (right), typical of the old Tasmanian type of sheep. The photograph was taken in 1876.



[*Photograph after H. B. Austin, "The Merino, Past, Present, and Future."*

Stud ewes in Australia in 1900 at the height of the Vermont boom.

live weight of the best rams was about 100lb. and for ewes just under 70lb." These weights were said to be of sheep in the wool and in the best condition.

The Empress Maria Theresa of Austria also followed Saxony in introducing Merinos. She imported 300 picked Negrettes, taking them to Hungary, where they provided the foundation stock of the Imperial stud at Meropail. When their success was evident further importations were made and the Empress saw to it that the blood was used extensively in the Austro-Hungarian flocks, and very soon the Hungarian sheep were nearly pure Merino. The famous Lichnowski stud of Silesia was an offshoot of the Austrian Imperial flock.

The first Merino introductions into France are said to have been made in 1770, and in 1773 Louis XVI established the royal farm near the village of Rambouillet and used it as an experimental farm. The King, acting on the advice of some scientific experts, approached the King of Spain and once more the royal favour produced Merinos for export, this time nearly 400 from Leon in 1786. In 1801 a further flock of 40 ewes and 6 rams of Infantado strain was added. From then on the stud was bred in and up with only odd infusions of the same strain. In 1794 the average fleece weight of rams was 7lb. 8oz. and of ewes 7lb. 1oz.; in 1835 the rams' fleeces averaged 17lb. 1oz. and those of the ewes 11lb. 5oz. The first introductions were distributed among various breeders and later the Government established stud farms all over the country. The object was to breed from the Merino an animal that would be adopted by the sheep farmers of France to improve the existing flocks of the country, but the prejudice of the French farmer was not to be overcome. Even Napoleon tried hard to help the industry in France with the introduction after the Treaty of Basle of 20,000 Merinos which were driven across the Pyrenees into France. In spite of this the Government stud of Rambouillet was the only one of any consequence which persisted.

At a later period the Rambouillet Merino of France had a beneficial effect upon the Australian Merino, but only when used as an infusion, and that sparingly.

England's Tardy Interest

One of the reasons why England did not interest herself earlier in importing the Spanish Merino is probably that she was a great maritime power. Her merchantmen could obtain all the fine wool she required first from Spain and later from Saxony. The first authentic introduction of Merinos into England was at the instigation of George III, sometimes called "Farmer George" because of his interest in breeding stock. Because of the doubtful blessing of the Spanish King, a small draft of Merinos was purchased from the Estremadura district and shipped secretly from Portugal in 1778. They were a poor lot apparently, so the King of Spain was then approached, and in 1791 a small draft of choice Negrette strain (4 rams and 30 ewes) was presented to George III by the Marchioness Campo di Alange. These were sent to Kew and all the first importation sold.

Through bad management the sheep were allowed to deteriorate, though the wool is said to have held. In the years 1798 to 1802 the average fleece weight from this flock was 3½lb. greasy and 2½lb. scoured. Although the sheep eventually became fairly well acclimatised, the breed had to meet a good deal of prejudice and it was not until 13 years after the introduction of the Negrette flock that the Merino enthusiasts decided to risk them for sale at public auction. In 1804, however, 49 of these were sold at auction, the prices ranging from £6 7s. 0d. to £44 2s. 0d. each. Among the purchasers was Captain John Macarthur, who took 7 rams and a number of ewes back to his flock in Australia.

In 1808 a flock of 2000 picked sheep of the great Paular strain, chosen under very exclusive conditions, was presented to George III by the King of Spain. A Merino Society which had for its principal aim the encouragement of Merino sheep breeding was formed in 1811. Its first president was Sir Joseph Banks, who accompanied Captain Cook as botanist on the successful voyage to Botany Bay. One of its most distinguished members was Lord Western, who was a great breeder; Bennett, who had 7000 Merinos, was another. However, the prejudice against the Merino persisted and the society was short-lived. Its failure was due partly to the unsuitable climate and also to the fact that the English farmer of that time sought principally a meat-producing animal. However, several excellent studs persisted for many years, principally Lord Western's, the Sturgeon, the Dorrien, and that of Thomas Henty. Actually many of these Anglo-Merinos, as they were termed, carried an infusion of long-woolled blood, but in the early days of Australian sheep breeding many useful introductions were made from these studs, so the Merino Society was not without its value.

The Merino in U.S.A.

A brief reference should be made to introductions of the breed and the development of the Merino in the United States, for the Vermont boom in Australian sheep history at the latter end of the 19th century had a profound effect upon the sheep industry of Australia, the results in many cases being disastrous.

The United States was fortunate in that she had at various times as Ambassadors at the Spanish Court several men of foresight who had a keen interest in the possibilities of development of a Merino industry in the United States. These men were able to make some outstanding introductions into America, often of some magnitude. The Australian breeders must have envied the ease with which the Americans obtained these fine introductions.

The first Merinos are said to have been imported into the United States by a W. Porter in 1793, but through ignorance they were killed for mutton. In 1802 Colonel Humphreys, an Ambassador, was instrumental in the purchase and export of 21 rams and 70 ewes of excellent Infantado strain. A later Ambassador, William Jarvis, in 1809 procured 200 of the Escurial strain, which were supposed to be the only introduction of this family. Farmers then began to import for themselves, but in 1809 Jarvis took advantage of the break-up and dispersal of the great Spanish flocks by purchasing 4000 sheep. Speculators now imported on a large scale, for in 1810 and 1811 about 16,000 Spanish Merinos were imported. The majority were auctioned as they reached America and high prices were received for the best of them. The following figures give some idea of the wool production of the Merinos first introduced into America. The average fleece weight for ewes was 4½lb. to 5lb., and for rams from 8lb. to 8½lb. greasy. Jarvis's flock from 1811 to 1826 averaged 4lb. of washed wool.

Through the years the Rambouillet type was introduced to a greater extent, the Americans aiming for a better carcass, though at the expense of wool. Probably because of this and the poor type of some of the Saxony introductions, the Saxony Merino was deemed a failure by the American historian Henry S. Randall and by later American breeders, and the Vermont Merino became the typical American fine-woolled sheep, deriving its name from Vermont, which had become the centre of the sheep-breeding industry. Briefly, this type was later characterised by large bodies of fair carcass conformation, but practically covered with concertina-like wrinkles. It cut a heavy fleece of comparatively strong and low-yielding wool.

"Vermont Craze" in Australia

The "Vermont craze" in Australia is worthy of note as a landmark in the development of that country's Merinos. It was a phase of retrogression rather than progress, for many breeders used the Vermont blood to the extent that it swamped the Australian. Forgetting the experience of 90 years in developing a type to suit the country, they went to the extreme to obtain a large-framed sheep of great fleece weight and sacrificed their own type of sheep and quality of wool. Samuel McCaughey was one of the best known of these men. Other famous stud breeders, notably the Peppins, introduced Vermont blood to their flocks with advantage, but only sparingly, and they retained the essential features of the Australian type and quality of wool. There was later a reaction against the Vermont strain, and the struggle was begun to eradicate such faults as lack of length in the staple, the bad yellow colour of the yolk, and the ugly wrinkles, but in many cases the damage had been done and many studs were ruined.

The enormous losses which the Spanish Merino flocks suffered due to the Napoleonic wars, plus the heavy exportations from that country, resulted in the ruin of the industry in Spain. The cream of the flocks had been taken and little or no effort was made to build them up again. Previously, due to the manner in which they were reared and to their hardiness, the fine-woolled sheep of Spain persisted for centuries, in spite of devastating wars and conquests by invaders. The Spaniards had never been good stock breeders and the Merinos existed and persisted in spite of them, as far as efforts to improve the breed were concerned. Today Spain has to import wool and the fame of the Spanish Merino is now a matter of history.

Spain, Saxony, Germany, England, France, and America have been the sources of supply of Merino blood for Australia; from Saxony the great bulk of the blood has come and the best results, but it has been the fusion of the Saxony, Germany, Rambouillet, and English strains that has evolved the Australian type.

In the comparatively short period of 140 years of development in Australia, compared with the history of the Merino in Spain, extraordinary improvement has been made. The definite Australian type has no other branch of the Merino family to compare with it, and today Australian wool is unsurpassed. The climate and feed of Australia, of course, have suited the breed admirably and have assisted in the development of its constitution. Further, Australia in the early years obtained excellent blood from the studs of Europe, but the greatest factor in the evolution of the Australian Merino has been the genius of its breeders.

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METEOROLOGICAL RECORDS FOR FEBRUARY

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches						Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall			
				Maximum	Minimum				Amount	Date		
Auckland	160	67.6	+ 0.8	80.5	54.6	3.01	7	— 0.70	1.25	6		159.4
Tauranga	10	66.4	+ 1.5	79.1	46.2	3.67	9	— 0.23	2.02	16		188.4
Ruakura	131	63.9	+ 0.0	81.2	39.1	2.86	13	— 0.32	1.35	16		159.2
Rotorua	980	64.2	+ 1.9	80.0	43.0	3.74	11	— 0.44	2.13	16		179.3
Gisborne	12	68.2	+ 3.1	86.0	44.8	0.78	5	— 2.29	0.21	16, 17		216.3
New Plymouth	160	63.4	+ 0.8	74.7	46.3	4.72	11	+ 0.56	1.77	16		190.3
Napier	6	69.2	+ 3.8	87.0	47.8	1.19	7	— 1.53	0.45	16		246.4
Taihape	2157	61.4	+ 2.5	76.7	43.2	1.61	7	— 1.26	0.80	16		
Wanganui	72	65.5	+ 2.1	82.8	46.8	2.46	6	— 0.32	1.33	16		209.2
Palmerston North	110	64.2	+ 1.9	83.5	45.2	4.58	7	+ 1.71	3.61	16		199.8
Waingawa	350	65.4	+ 3.0	90.0	40.0	3.42	6	+ 0.63	2.19	16		249.0
Wellington	415	63.4	+ 2.2	76.8	47.2	1.29	10	— 1.83	0.41	16		187.9
Nelson	24	63.9	+ 1.1	79.6	43.7	1.76	6	— 1.13	1.27	22		228.3
Blenheim	12	66.0	+ 1.9	87.2	40.3	1.11	5	— 0.91	0.42	19		273.6
Hokitika	12	57.8	— 0.6	70.0	40.4	10.39	19	+ 2.39	2.42	22		156.0
Hanmer Springs	1225	63.1	+ 3.8	85.3	35.0	1.96	8	— 1.82	0.56	22		219.5
Christchurch	22	65.1	+ 4.3	93.7	38.4	0.15	8	— 1.66	0.04	23		226.9
Ashburton	323	65.3	+ 5.1	95.4	33.4	1.04	6	— 1.57	0.29	18		206.6
Timaru	56	63.6	+ 3.4	93.6	40.2	1.34	9	— 0.89	0.31	18		214.0
Alexandra	520	62.2	+ 0.7	88.0	37.1	3.00	10	+ 1.50	1.33	19		185.0
Taieri	80	60.8	+ 3.1	94.3	37.2	1.72	11	— 0.69	0.70	19		
Invercargill	32	59.0	+ 2.2	88.0	40.0	3.68	14	+ 0.06	1.05	19		150.3

Influence of Climate and Soil Types on Nectar Secretion

AN important problem which the beekeeper has to solve in the establishment of out-apiaries is not only the abundance of the nectar-producing flora in the locality but also its dependability in providing both regular and economic yields of honey. Though it is true that to a large extent a beekeeper must take whatever yield the district can furnish, it is also true that when he studies his district with an understanding of the principles which govern plant growth and nectar secretion, the honey-production potential can usually be forecast more easily and exploited more fully. In this article E. Smellie, Apiary Instructor, Department of Agriculture, Christchurch, discusses the influence of climate, soil fertility, and topography on nectar secretion in Canterbury.

FACTORS which influence nectar secretion continue to be a subject for much speculation among beekeepers, showing that the physiology of nectar secretion is not yet understood fully. Nevertheless, it is known that flowers of different species secrete nectar of different types and that the nectar of any one species may differ in character and quantity according to soil, climate, and other environmental factors influencing the growth of the plants.

Climate of Canterbury

Canterbury has a very wide range of climatic conditions. The annual rainfall along the coastal areas is about 26in., gradually increasing inland to 46in. in the foothills of the Southern Alps. Over the greater part of the plainland the rainfall varies between 28in. and 38in. and the average number of rain days is about 125. In general, the rainfall is adequate and evenly distributed through the year, though in some districts the amount borders on deficiency.

All areas in Canterbury Province are subject to strong north-west winds. These are hot, drying winds, which often blow continuously for several days in summer and autumn. In the lower-rainfall areas these winds reduce the efficacy of the rainfall.

Temperatures vary widely between the hottest and coldest. Summer temperatures are very warm and the atmosphere invariably has a low humidity, and winter temperatures range from mild to cold. Successive frosts check the growth of grass and clovers.

Snow rarely falls along the coastal belt, but inland areas with an altitude of 600ft. or more usually receive at least one fall of snow each year, and in some cases it may lie on the ground for a fortnight or more.

Topography

The topographical features of Canterbury are of some importance to beekeepers.

The Canterbury Plains, the greatest area of flat land in New Zealand, stretch some 130 miles from Amberley in the north to as far south as Timaru, widening in the middle zone to 40 miles. The plains narrow toward either end and rise gradually to a height of nearly 1200ft. at the foothills which form their western boundary.

Beyond these foothills high, rugged snow country, unsuitable for beekeeping, extends to the main ranges of the Southern Alps. Northward from Amberley tussock ridges and undulating hills predominate, though areas of flat arable-farming land occur in the Waikari, Culverden, and Cheviot basins.

Between Timaru and the Waitaki River, the southern boundary of the province, undulating downlands and low hills extend westward from the coast for 15 or 20 miles to the first of the higher tussock ridges. In general, this is fairly-good beekeeping territory.

Another area of hill country is formed by Banks Peninsula, which consists of an old volcanic cone that has been worn down by erosion.

Soil Types

The parent material in the composition of Canterbury soils is greywacke, a substance formed from sediments laid down in water and subsequently hardened by earth pressure. On the steep slopes, such as in the western ranges, the soils are derived by weathering of the greywacke gravels, but on much of the lowland country the soils were formed from windblown deposits of greywacke that was originally eroded by glacial action and later carried along and laid down in the wide beds of the main rivers. In addition to the wind formations, water-borne or alluvial deposits also occur along portions of the main rivers and on portions of the land nearer the coast. Some of these are being added to during present-day floods.

The topsoils are dark grey to black and vary in depth, giving rise to soil variations in texture, water-holding capacity, and fertility. The parent soil-forming materials in Canterbury are low in phosphate and lime-bearing minerals, especially in the areas near the foothills, where leaching is greatest, and applications of these minerals are essential for present farming requirements.

Surveys recently undertaken in Canterbury by the Soil Survey Division of the Department of Scientific and Industrial Research have disclosed more than 40 soil types, composed of variations of sands, stones, and gravel, sandy loams, silt loams, and clay loams. However, despite these variations in soil type, Canterbury agricultural areas can be classified broadly into 4 main soil groups based on the types of farming practised—light, medium, medium to good, and heavy cropping lands. A wide range in productivity—sometimes within relatively-short distances—is a characteristic of the groups, resulting from differences in the moisture supply available to plants. For instance, on the downs and on the flats where the soil is more than 18in. deep, plant growth is affected by lack of moisture only in very prolonged dry weather, but on the flat and terrace areas where shingle lies only 9in. or less below the surface soil, moisture is invariably insufficient to meet the full demands of the better grasses and clovers.

Therefore, the ability of the soil to retain moisture for plant growth is the main factor affecting the type of farming practised and—of greater importance to beekeepers—the types of crops and pastures grown.

Farming Practices

In general, the farming economy of Canterbury is built up largely around the production of wool and fat lambs, and in conjunction with this production mixed arable farming in its truest sense is practised.

About 1/6 of the total acreage of downland and plainland is cultivated each season for growing cash and feed crops, leaving only 5/6 in permanent pasture for grazing. These pastures are usually sown down with high-fertility-demanding grasses and clovers and are ploughed in every 3 to 10 years according to type of farming and soil. This renewal of the pastures is associated with a crop-rotation programme which is necessary for the maintenance of soil fertility and for the heavy grazing of a greater population of sheep and other livestock.

In some areas of light and stony land only the low-fertility-demanding grasses can exist, but in others soil fertility has been raised by sound management or by irrigation systems which enable the better type of pastures to be developed and maintained. In many instances this has been accomplished on land which a few years ago was regarded as relatively poor.

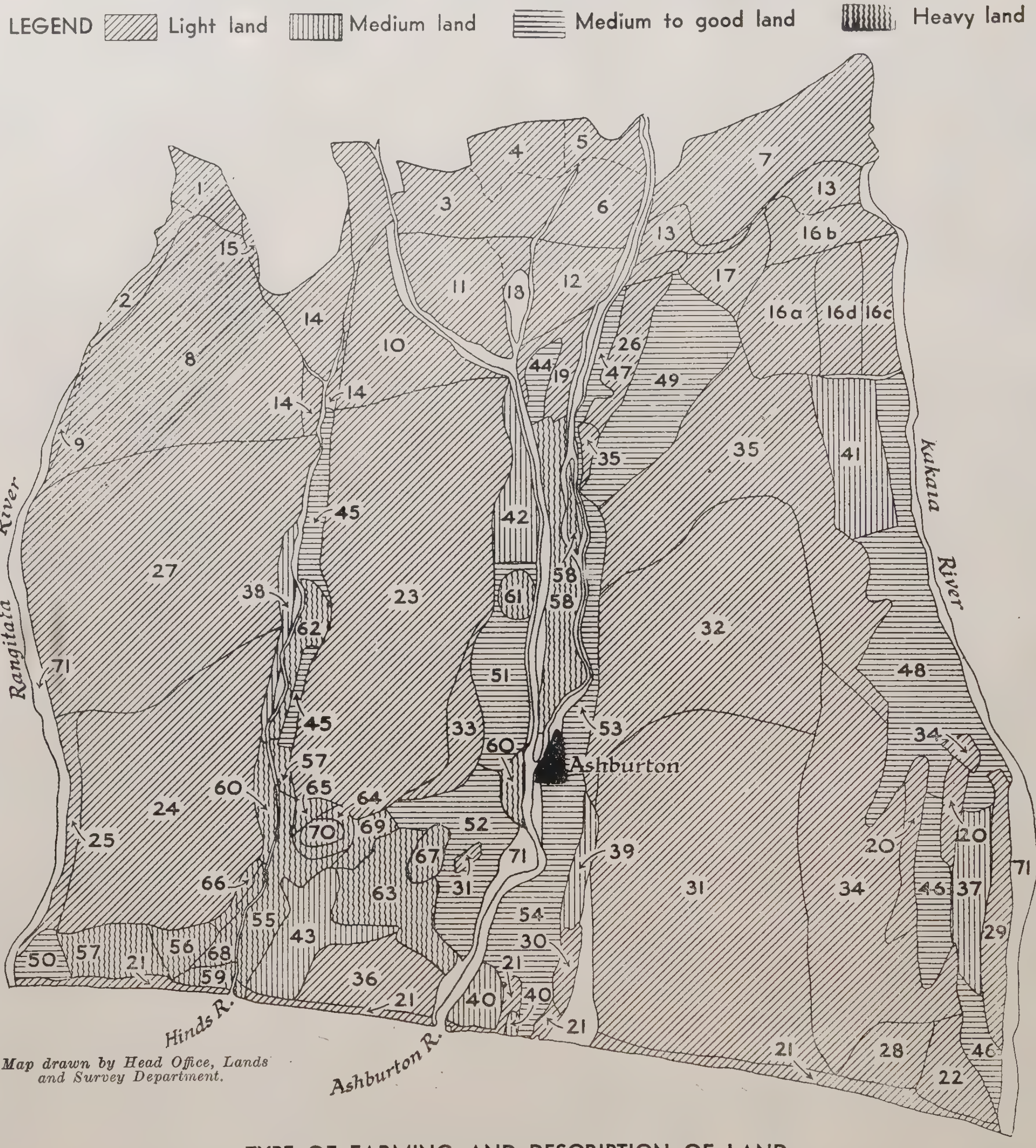
Canterbury beekeepers receive about 95 per cent. of their honey yield from pasture land, so the factors which influence pasture development and maintenance are of extreme importance, as they also determine both the honey-yield potential and the hive-carrying capacity of any area.

Influence of Climate

In addition to farm management influences, climatic conditions cause variations in the nature of the honey flow from season to season. For that reason it is a good policy for beekeepers to establish their out-apiaries on as many types of land as is possible to ensure consistent over-all averages each season.

Usually the first white clover bloom appears in October on the lighter or warmer soils, and the main flow from

LAND UTILISATION IN ASHBURTON COUNTY


LEGEND
▨ Light land
Medium land
Medium to good land
Heavy land
Rangitata River
Rakaia River
Hinds R.
Ashburton R.
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[*Map drawn by Head Office, Lands and Survey Department.*

TYPE OF FARMING AND DESCRIPTION OF LAND

STORE SHEEP—FOOTHILLS COUNTRY: 1 to 7.

SHEEP — SUB-FOOTHILLS COUNTRY: 8 to 13.

SHEEP AND WHEAT—SUB-FOOTHILLS COUNTRY: 14 to 16b, fair to medium land; 16c to 18, good land.

SHEEP—LIGHT PLAINS COUNTRY: 19 to 21, poor land; 22 to 24, fair to medium land; 25 to 27, good land.

SHEEP AND WHEAT—LIGHT PLAINS COUNTRY: 28 and 29, poor land; 30 to 33, fair to medium land; 34 to 36, good land.

FAT LAMB AND WHEAT COUNTRY: 37 to 43, fair to medium land; 44 to 49, good land.

MIXED CROPPING AND SHEEP COUNTRY: 50 to 54, fair to medium land; 55, good land.

MIXED CROPPING, SHEEP, AND DAIRYING COUNTRY: 56, poor land; 57 and 58, fair to medium land; 59 to 62, good land; 63, farms mostly in cocksfoot.

MIXED CROPPING AND DAIRYING COUNTRY: 64, without cocksfoot; 65 to 67, up to 15 per cent. cocksfoot; 68 and 69, mainly cocksfoot.

NEGLECTED PEAT—RUN-OUT FOR SHEEP AND CATTLE: 70.

RIVER BED GRAZING COUNTRY: 71.

this source develops during December and January. The time of starting and the vigour of the flow are governed by the amount of moisture in the soil and atmospheric and earth temperatures.

Light and Medium Land

Light and medium to light cropping soils in some instances lie in narrow strips through a heavier soil type, though in general they are compact and cover extensive areas. These soils consist of combinations of sand and silt loams with varying amounts of gravels and stones intermingled. The depth of soil in this class of land is not more than 9in., so it varies from droughty to moisture retentive according to the amount of rainfall. Along the coastal zone the lighter soils are subject to both inadequate rainfall and cool winds. On the stony terraces near the foothills north-west showers assist the soil to retain moisture longer.

Moisture in excess of plant requirements quickly drains away from these shallow soils into the underlying shingle, and for that reason the lighter lands respond to temperature changes much more quickly than the heavier types. Another feature of this class of land is that sudden changes in temperature while the clover is in bloom do not retard the rate of nectar secretion for so long. However, if the clover bloom is checked by a late frost of more than 4 degrees, especially inland at altitudes of up to 1200ft., invariably there is no further honey yield of any consequence that season.

Extensive clover bloom always appears first on the lighter and medium soils. The period of maximum blooming, as well as being early, is usually brief because of the very rapid parching of the pastures, but during the drying-out period a vigorous honey flow develops. The average yield is usually less in the coastal regions than along the foothills and in intermediate zones where the influence of north-west showers prolongs the effective period of bloom.

Maximum secretion of nectar is promoted by soaking rains in December followed by a moderately-warm period. With colony strength built up and held at its maximum at the start of the flow, yields of more than 100lb. per colony are possible under these conditions. With moderate temperatures, in contrast to much higher temperatures, the heat radiated by surface stones is sufficient to induce nectar secretion without burning the clovers.

In most seasons the honey flow from clover on this class of land has ceased by New Year, and though the seasonal yields vary in light-soil areas, the crop rarely fails completely where white clover has been grown to any extent. The subsequent floral sources, such as catsear and thistle, usually are of little value in adding to this surplus, as with the parching of the soil the amount of moisture available to the plants is not conducive to a prolonged period of nectar secretion.

Where irrigation water is regulated on to light- and medium-land pastures clover growth can be maintained, and with a much longer blooming period colony averages are better. However, honey yields from areas under irrigation are not as great as the improved condition of the pastures would indicate, not because of any adverse influence on secretion but because of the heavier stocking, particularly of fat lambs, that the irrigation makes possible.

Medium to Good Land

Medium to good cropping land is not as extensive in total area as the light and medium to light cropping areas, in contrast to which most of the medium to good areas are formed in long narrow strips. Most of these strips are on the south sides of the main rivers and were formed from silt that was dried and blown by strong north-west winds from the very wide riverbeds following the receding of water after each flood. The soil in consequence is mainly a silt loam, usually 18in. deep or more, overlying the shingle and sand deposits.

This class of land is very fertile and, because it can withstand drought conditions for much longer than the lighter soils and drains more freely than the heavy alluvial soils, it is without doubt the most reliable for honey production.

Pasture growth is very vigorous on these soils, and to use them to the best advantage paddocks are first grazed very heavily or shut up for hay, and then left later to produce seed from the grasses and clovers. The second growth of white clover has very short stems, and the bloom is very dense toward the end of December. As soil temperatures are then also ideal for inducing nectar secretion, the main honey yield is gathered from then until the end of January or later, according to the season. Though a soaking rain in December is a decided advantage, its absence is not as serious on this class of land as in the lighter-soil areas. The honey yield from white clover is supplemented substantially by yields from catsear, thistle, and, in very dry seasons, lucerne. Average seasonal yields are about 1cwt. or more per hive.

Heavy Land

As the heavy cropping land was formed from alluvial deposits, most of it is in coastal zones near the main rivers. Typical heavy cropping land is located in fairly-compact areas such as in the Ellesmere, Tai Tapu, Temuka, and Willowbridge districts. Other heavy-land areas are in very narrow strips in some inland locations alongside the larger rivers.

The cropping of these areas is associated with dairying and the growing of high-producing pastures. Fat lambs and wool are also important, and pastures are usually left down for a number of years.

The soil is of great depth and has a clay base. Therefore it is very moisture retentive and in consequence requires a long period of hot weather to develop the soil temperatures necessary to promote a vigorous secretion of nectar by white clover.

White clover blooms prolifically in most of the heavy-land pastures, but because of poor or inadequate drainage many of the areas in bloom do not yield a satisfactory honey crop. In other districts poor drainage has soured the soil and prevents a suitable clover establishment. Drought conditions are ideal for a maximum honey yield from white clover, but as these do not occur with any frequency the average yield in this class of country does not exceed 90lb. per colony. In very wet seasons a crop failure is always possible, despite an abundance of clover bloom. The main honey flow from clover in these areas usually begins in January, or in late seasons in February, and clover is in bloom until late March or April.

During the past few years State drainage schemes have improved the productivity of some waterlogged districts, and in consequence beekeepers have received satisfactory yields in what previously was poor honey-producing country.

Analysis of Potential Yields

The medium to light and medium to good cropping soil areas are of more value to the Canterbury beekeeper than either the extremely-light or the heavy soils. In a choice between extremes, the lighter soils can sometimes give more reliable yields and averages than the extremely-heavy soils which seemingly show a better prospect.

With low humidity, absence of cloud, and a high number of days of hot sunshine favouring the secretion of nectar, Canterbury districts are also subject to low rainfall and to cold east winds which cause a break in the flow. The strong north-west winds cause severe mortality among flying bees, and in some years this factor seriously reduces the crop average; in other seasons these hot winds partially evaporate the floral secretions and leave in the nectaries a viscous residue which the bees have difficulty in gathering.

The radius of bee flight during the flow is not usually very great, and that, with the acreages in other farm crops, makes the hive-carrying capacity of out-apiaries very small. The vigour of the main flow, particularly on the lighter land, is another influence. In general, outyards are established ½ to 1 mile apart, with between 20 and 30 colonies in each, and in average years that may be considered capacity stocking.

Undulating country such as is found in the north and south extremes has soils overlying clay formations, and these react to temperature changes more rapidly, especially on the sunny faces, than do the alluvial clay-based areas. Undulating country, in the main, is fairly consistent for honey production, especially when lime has been applied and good clover pastures have been established, but at their best the honey yields from it seldom compare with those from the medium to good cropping soils overlying the shingle and sand formations on the plains.

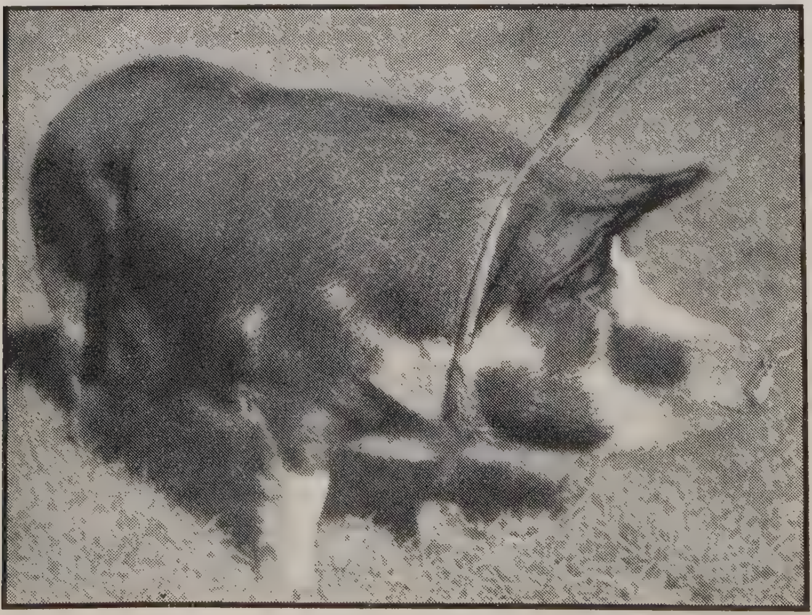
Device for Preventing Pigs from Straying

AS materials for pig fences are in short supply and expensive, many farmers keep their pigs confined to a run rather than take the risk of the pigs getting through the ordinary fences and straying if allowed to run in the farm paddocks. However, for best results sows require free-range grazing, and this article by W. B. Wards, Fields Instructor, Department of Agriculture, Dargaville, describes a satisfactory device adapted by a Northland farmer from a suggestion in an earlier issue of the "Journal" and which enables sows to be grazed on farm paddocks without the provision of special pig-proof fences.

ON most dairy farms fences used for subdivision are usually the four-strand barbed-wire type, which offers no barrier to pigs, though in passing through them the pigs suffer scratches, with a consequent risk of infection, which may seriously affect the health of the pigs or their carcasses. Farmers therefore usually keep their pigs within a pig run, which is properly fenced to prevent the pigs from straying, but which becomes very muddy in winter and dusty in summer and provides little or no feed and little exercise. However, because farmers realise both the value of pasture to pigs and pigs to the pasture and know full well that sows are much better on free range, they are frequently permitted the run of the farm, in spite of the danger of their straying and causing local ill feeling. The farmer knows, too, that much waste of valuable droppings and urine occurs through confining pigs to pig paddocks all the time. These over-fertilised pig runs produce little or no grass because of the excessive trampling that occurs.

In the June, 1942, issue of the "Journal" an article by the Livestock Division dealt with a simple device which enabled a Hastings farmer to graze his sows on farm pastures without danger of their straying from field to field or on to a neighbour's property. The device consisted of ½in. or 7/16in. round iron bent to fit the pig's neck like a collar. By catching in the wires of a fence it prevented a pig passing through. A similar device has been used successfully for many years by Mr. F. J. Johansson, Mititai, Dargaville. The material used by Mr. Johansson is old, discarded, conduit piping. It is lighter and easier to shape than the iron used by the Hastings farmer and can be bent almost to shape on the pig. The important points are to provide a short V bend to allow freedom for the gullet and a good fitting bend on the top of the neck. When the desired shape has been obtained a hole large enough to take a piece of baling wire should be bored in one side member 2in. above the neck and the ends should be bent forward and outward. When fitted the horns of the device should be tied together by running a piece of baling wire through the hole made in one side member and winding a few turns round the horns.

By the use of this collar it is considered that more grazing for sows could be made available by farmers whose fences are not sufficiently pig proof for their sows to be run on fresh paddocks.



[*Wairoa Studio photo.*

The device used by Mr. Johansson, of Mititai, to prevent pigs from straying.

Certified Government Stock Seeds

APPLICATIONS for allocation during the current year of the following Certified Government Stock seeds are at present being accepted by the Department of Agriculture:—

Perennial ryegrass
Short-rotation ryegrass
Italian ryegrass
Timothy
White clover
Montgomery red clover
Cowgrass (broad red clover)
Lucerne

Applications for these seeds must reach the Director of the Extension Division, Department of Agriculture, Box 3004, Wellington, not later than **May 31 next** to be considered in any allocation to be made this year.

Applications must be made by mercantile firms on behalf of individual growers and must include:—

1. Name and address of grower.
2. Quantity of seed required.
3. Acreage of paddock to be sown. (If more than one paddock acreages of each to be given separately.)
4. Registered number and letter of area concerned if possible.
5. Where more than one kind of seed is requested the application must state clearly whether the seed is required for separate areas, whether the requirement is in the nature of an alternative application for the same area, or whether the different kinds of seed are to be sown together in the one area.

Note.—Certified Government stock cocksfoot seed is produced and distributed by the Canterbury Agricultural College, Lincoln, to whom intending purchasers are referred for particulars.

Banding of Waterfowl

AS the means of studying the movements of waterfowl the Wildlife Branch of the Department of Internal Affairs has for three seasons live-trapped birds in certain areas and liberated them after banding them on the right leg. It is only when these bands are returned to the Wildlife Branch that factors connected with the conservation of waterfowl can be studied. Sportsmen who take birds carrying bands should send the bands to the Wildlife Branch, Government Buildings, Wellington, with a covering note giving the date on which the bird was shot and the locality.

Valuable help wa given by shooters last season and it is hoped that they will continue to assist the study of the movement of birds by forwarding all bands recovered this season.

Household Poultry: Location and Type of Housing—Fixtures, Litter, and Water Supply

PROBABLY no single feature of household poultry keeping receives less attention than the henhouse itself. The owner frequently knows very little of poultry diet, but successfully makes use of what he has learnt about diets for people and applies common-sense ideas from knowledge gained in rearing and feeding infants. On the other hand, in many cases so little thought has been given to the backyard henhouse that the majority should be pulled down and rebuilt. Advice on the subject is given in this month's article for the household poultry keeper by W. L. McIver, Poultry Instructor, Department of Agriculture, Dunedin.

MOST domestic poultry units seem to be pushed "down the yard" out of sight as much as possble, in a corner or even under trees. The inference seems to be that the hens are unimportant and even uneconomic. Such views should be dispelled and the hen permitted to take her proper place as a family provider. Just as it can be said that the family is not complete without children, so also is the home incomplete without the flower garden, the vegetable garden, and the occupied henhouse. The garden can help the fowls, the hens can certainly assist the garden, and both can give valuable aid to the family by providing good foods and reducing living expenses.

Location of Henhouse

Though the decision where to site the henhouse is not nearly as important to the backyarder as to the commercial farmer, some constructive thought must be given to it. A well-built house will stand for years, but if it is not properly planned, amending it later is not easy. The smallness of the average household section, its shape, and the type of land usually dictate where outbuildings and poultry houses must be built, but if a choice of situations is available, these points should be kept in mind:—

Good drainage is required.

Sunshine is essential, so the house must face in a northerly direction. If it is oriented away from due north, it should be toward the east and not the west.

Prevailing northerly winds, or valleys, hills, and nearby large buildings causing draughts from that direction, may compel facing the building away from the north.

Hens require fairly-constant attention, so the henhouse should be close enough to the dwelling to limit the amount of walking involved in looking after them.

A henhouse should not be built against a neighbour's fence.

The local building by-laws must be observed.

If the section is level and rectangular the best place for the henhouse is not right down the garden in a corner but as near the middle of the garden as possible. Most gardeners use a 3-year crop-rotation system, and the reasons for dividing the area reserved for gardening and poultry into 4 equal parts are shown in the diagram on the next page.

Under this system wire-netting for the hen run should not be erected permanently but stretched on a number of suitable-sized wooden frames, which can be moved yearly to another section of the garden and erected with the aid of posts.

Type of Housing

The main aim in housing poultry is to make them comfortable so as to encourage egg production, conserve their body heat derived from food consumption (and, consequently, to conserve food), and induce health and stamina. The benefits obtainable from allowing the maximum of sunshine to enter the house must be considered, but so must the exclusion of rain and draughts as opposed to ventilation. Hens drink a great quantity of water; some of it goes into the eggs and some into the droppings, but a high proportion is expelled with the breath, as fowls have no sweat glands, so good ventilation is essential.

For only 8 or 10 fowls 6 sq. ft. a bird is required, but for 12 to about 50 hens 4 sq. ft. a bird is sufficient, and for a pen of 100 layers 3½ sq. ft. would be enough for each bird. Air space is necessary as well as floor space, but if the house is made high enough for the tallest member of the family to stand upright in it, it will be more than adequate for the requirements of the fowls.

In some aspects of poultry husbandry, including housing, the ideal is not attainable and a compromise is necessary to obtain as much as possible from the beneficial features with the minimum of detrimental ones. For example, a closed-in house would be warm but damp; a thoroughly-ventilated one would also be draughty; one

A suitable type of nest box for a household poultry run.

built with a netting front and no veranda would let in not only sunshine but also rain.

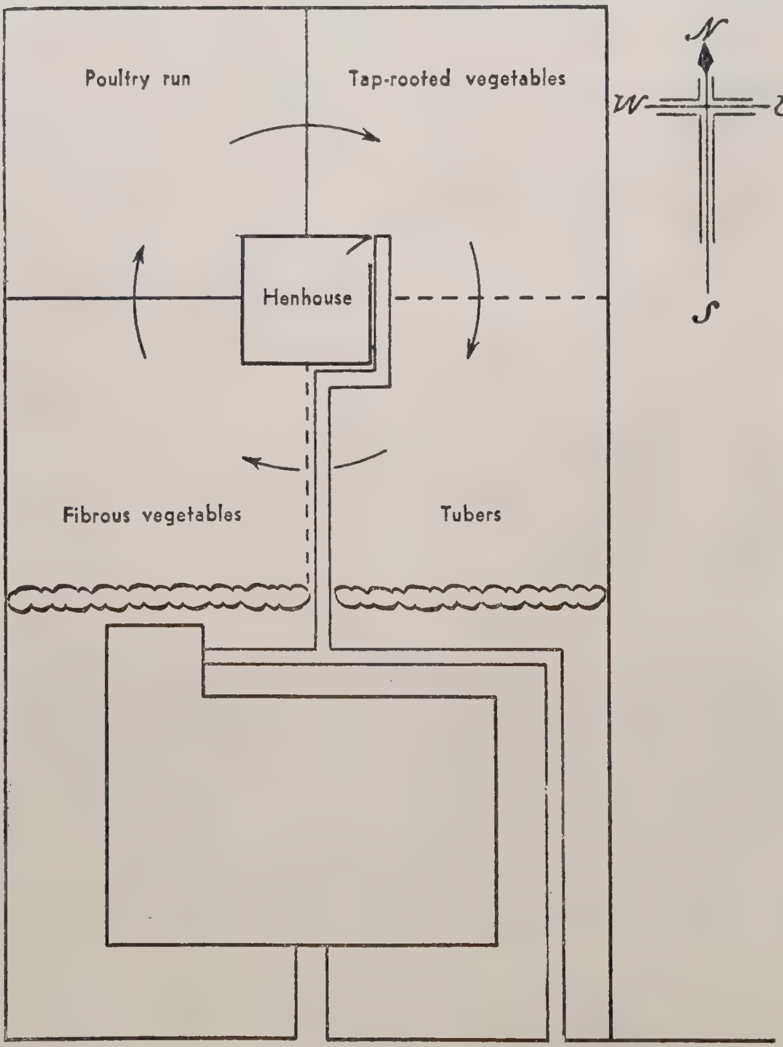
Common sense must influence the decision about the type of house to be built and the materials to be used. It is advisable to build thoroughly, skimp nothing, plan for the future, and consider the comfort of the hens. Plans of poultry houses and advice on all branches of poultry keeping are available from the Department of Agriculture.

Henhouse Fixtures

Before building is begun the placing of the following should be planned: The door into the house, the nest boxes, the drinking-water system, the feed hoppers (if it is proposed to use the dry-mash feeding method), and the perches and droppings board.

No hard-and-fast rules can be given for the placing of any of those items, but again the comfort of both the hens and the person who is to tend them must influence the decision. Above all, the floor space should not be cluttered up and the area which should be left clear for the hens taken away. The doorway is usually best placed in the front, the perches right at the rear, the nests on one side wall, and the hoppers on the other.

LAYOUT OF GARDEN AND POULTRY RUN



This plan shows the sequence for using $\frac{3}{4}$ of the garden area for a 3-year crop rotation and the remainder for a fowl run. The ground is used for a poultry run only every fourth year and therefore cannot become stale. The crop requiring the most manure always follows on after the fowl run.

To prevent water drips falling on to the floor litter, the drinking system may be built within a projecting, box-like cover on the outside of the front of the house; if its flooring is made of slats, spilt water will fall outside.

If hoppers are not made correctly, food will be wasted, as hens will seldom eat mash that they cause to spill to the floor. Before hoppers are made those of neighbours may be examined, and a proved design should be followed faithfully.

The usual advice is to make the nest boxes 12in. x 12in. x 12in. and to allow 1 to every 6 layers, but a more useful size, especially if the aim is to make only 1 nest to every 10 or 12 fowls, is 12in. wide, 14in. high, and 18in. deep. If an 8in. board is used for the lower part of the frontage, a 6in. opening will be left for the entrance. A 6in. board hinged to the 8in. one will allow the nest to be closed at night, preventing the hens from sleeping there.

Droppings boards are valuable for aiding in the control of disease provided they are cleaned daily, but they are not essential in most districts if the floor of the house is raised above the surrounding ground level, if the section is well drained, and if an adequate depth of dry, good litter is placed on the floor.

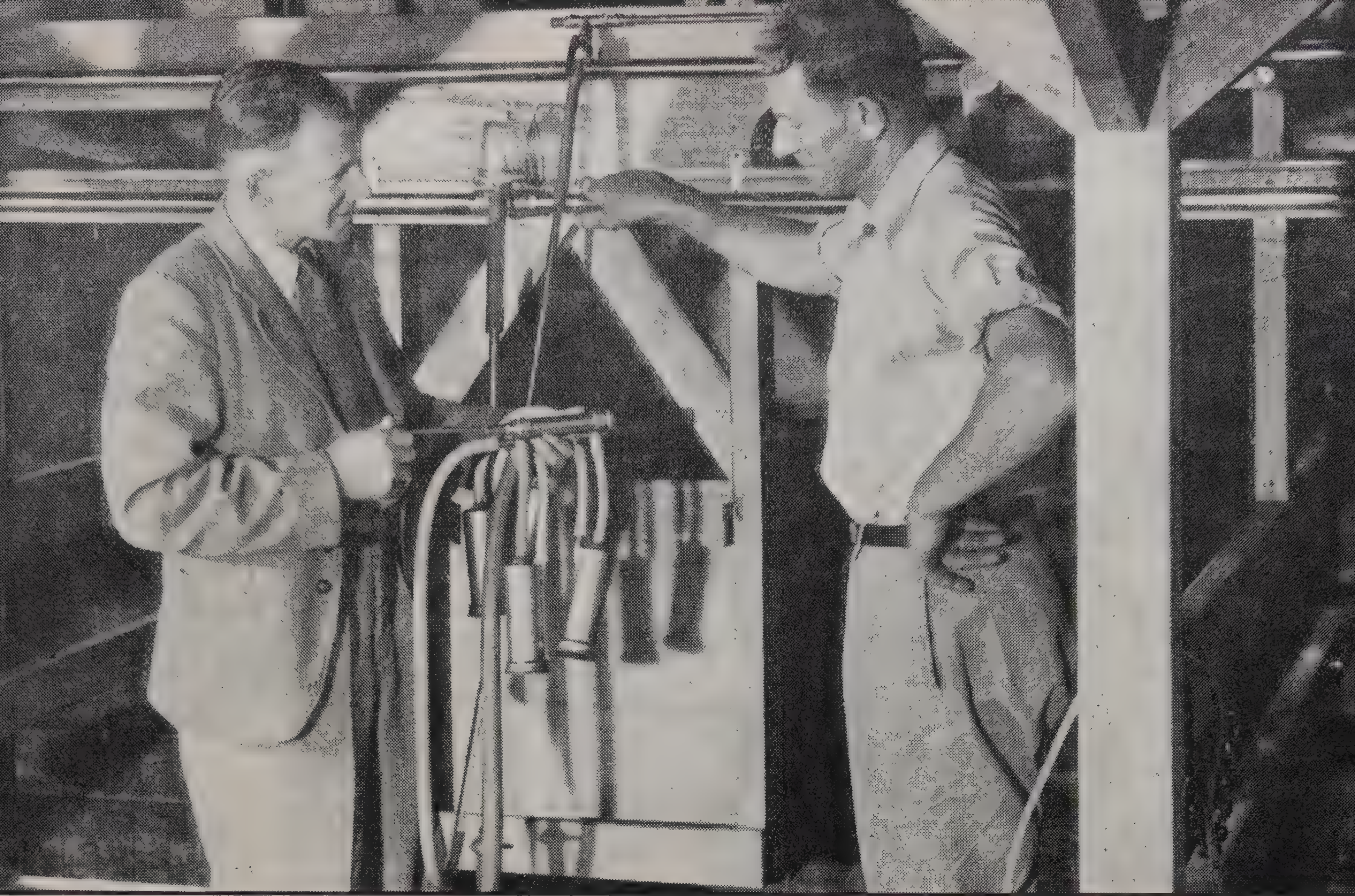
In the great majority of household henhouses little or no floor litter of any sort is provided. Hens like scratching and dust-bathing, yet the average householder expects them to put up with all the discomforts and disabilities of a hard-packed floor. If about 6in. of straw cannot be provided, coarse sawdust and dry garden soil in equal quantities, or even soil alone, is satisfactory. This litter should be sieved at intervals and the droppings removed.

Perches should be treated as important, not to be made out of any old material to hand. They should be of 4in. x 2in. timber, with the narrow edge upward, spaced 12in. apart, 6 to 8in. of space being allowed for each bird.

If feed troughs are used, they should be capable of easy cleaning. Troughs, hoppers, nests, and perches should all be cleaned thoroughly and regularly.

Fowls drink a very large quantity of water and it is advisable to have water piping laid on to the henhouse. At least, the hens should have suitable drinkers so that the water is kept cool, placed high enough to prevent litter being scratched into the containers and with a top cover to prevent the birds perching on the vessels and causing droppings to fall into the water. Drinkers should be cleaned daily.

Water is just as essential to the birds as feed. Hens will go off the lay more quickly if deprived of water than if underfed.



FARM DAIRY INSTRUCTION: METHOD AND PRACTICE

By W. G. BATT, Supervisor of Farm Dairy Instruction,
Department of Agriculture, Hamilton.

THE practice of farm dairy instruction is essentially instructional, advisory, and inspectorial, and it has become firmly established as a link between the dairy factory and the dairy farmer. It has as its base a service to the industry, individually in application and collectively in its result and reward.

UNDER the system of dairy produce grading and its differential payments according to grade, an improvement in quality of milk or cream brings immediate gain to the individual by a higher price for his individual supply, while collectively it brings gain to all suppliers to the factory, as improved quality raw produce usually results in an improved quality and higher price for the manufactured product, resulting in a greater income to the company and a higher return to all suppliers. The industry and the nation also gain, because higher quality exports are better able to withstand the competition of substitutes and the production of countries competing in overseas markets.

The industry and the Dairy Division have always recognised that the maintenance and improvement of quality would require the employment of two methods by the staff of Farm Dairy Instructors—inspection and instruction. The authority of inspection is conferred by the Dairy Industry Act and instructors have the ability to give expert advice.

Instruction in the Field

The practice of Farm Dairy Instruction was framed on the knowledge that the majority of faults in milk and cream are due to improper treatment and lack of care due to lack of knowledge, and that instruction and advice were needed to bring improvement. Even the uncleanliness of milking machines and equipment, apart from that caused by carelessness and irresponsibility, is due to a lack of knowledge of cleaning agents and methods which will give satisfactory results. Instruction in the field has brought, and is bringing, very considerable improvement in the quality of milk and cream and is of much assistance and benefit to suppliers.

Many and varied methods are employed by Farm Dairy Instructors to meet differing conditions and various causes of poor quality. In all cases of requests for assistance the Farm Dairy Instructor will personally assist in bringing about the desired improvement. Such assistance will include, in the first instance, the personal sterilisation of equipment used in the handling of milk or cream.

Assistance to Factory and Farmer

Requests of this nature are numerous and occupy a good deal of the time of the Farm Dairy Instructors. They may come from either interested party, the factory manager or the factory supplier. The manager of a cheese factory receiving a consignment of milk which might upset the manufacturing process of a whole vat of cheese; the manager of a butter factory receiving a consignment of cream of a quality which may lower the quality of the whole to which it is admixtured; the manager of a spray process powder factory receiving a consignment of milk of a quality which may coagulate and prevent the efficient running of his machinery by the blocking of the sprays; and the manager of a whole milk powder factory receiving a consignment of milk of a quality which will affect the flavour and keeping quality of his output and make it unpalatable may call for the assistance of the Farm Dairy Instructor, who will give priority to the case. After ascertaining the fault in quality he will proceed to the farm to advise or assist personally in locating and removing the cause.

Similarly, the farmer who finds that his produce does not receive the highest grade at his dairy factory, despite his best efforts, may call for the assistance of the Farm Dairy Instructor in locating a fault in practice which may

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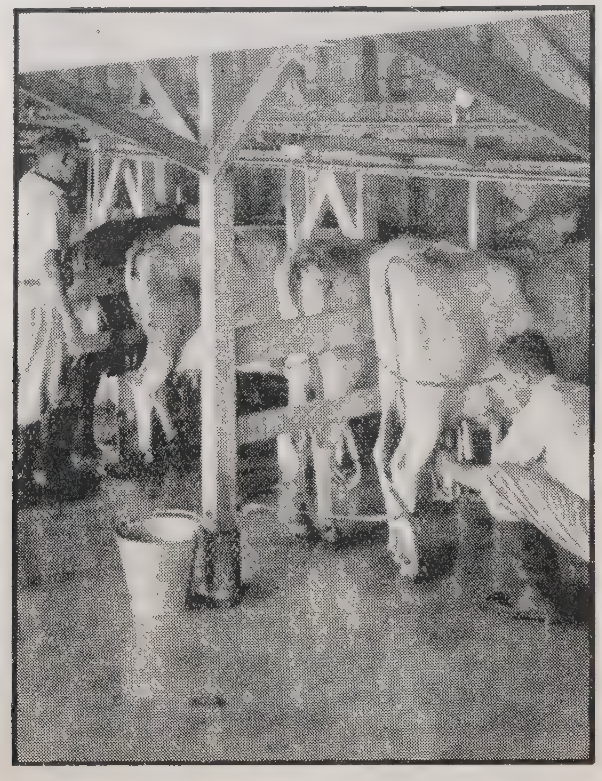
Heading photograph by National Publicity Studios.

FARM DAIRY INSTRUCTION



[*National Publicity Studios photo.*

Without hygienic conditions the most palatial and expensive dairy premises will not be the means of producing high-quality produce. Farm Dairy Instructors will advise on the selection of the site and the layout and construction of milking sheds on modern lines.

have been overlooked or which may be outside his knowledge. Persistent quality faults may be due to one or more of many causes and Farm Dairy Instructors are expected to give complete attention to such cases until conclusion is reached. This may mean in extraordinary cases an investigation of a number of conditions and the checking of various items by which the trouble may be resolved by a process of elimination.

Quality of Raw Produce

The dairy factory manager and grader obviously must be the judges as to the quality of raw produce most suitable to the production of high-quality manufactures, and its suitability or otherwise is indicated to producers by the grading systems and by the Farm Dairy Instructors. Unsatisfactory quality of raw produce is generally caused by the presence and development of undesirable bacteria, and whether such bacteria develop before delivery to the factory depends on whether conditions are favourable or unfavourable to their growth.

While the uncleanliness of dairy premises and equipment in the hands of careless and indifferent farmers is the cause of poor-quality production from those dairies, such poor conditions account for only a percentage of quality faults. There is a much greater number of producers who observe reasonable cleanliness but who have premises and equipment infested with bacteria due to their not having recognised the fundamentals of cleansing processes and not having adopted methods most satisfactory to the elimination of bacteria or of retarding their growth and development. There is also a vast field of other causes which make raw produce inferior for manufacture, and the application of the knowledge and assistance of the Farm Dairy Instructors must cover a wide range in dealing with the problem of each case. All officers appointed to this staff have therefore had dairy factory experience, frequently as managers, so that they are familiar with manufacturing requirements and of the greatest practical assistance in giving advice in the production of raw products most suitable for manufacture.

Typical Field Problems

A few of the many recent experiences of Farm Dairy Instructors in their field work may better illustrate the foregoing points. In one case a supplier sought the assistance of the Farm Dairy Instructor in removing a quality fault from cream described by the receiving factory as being insipid and lacking in flavour. The farmer could not be expected to be familiar with the several causes of this condition and the dairy factory was correct in allotting a low grade because it would make a butter insipid and lacking natural flavour. The Farm Dairy Instructor found the dairy premises and equipment in scrupulously clean condition and the usual and common causes of this quality fault were checked and eliminated in turn until the more uncommon cause—the presence of non-acid bacteria—was determined. He was then able to apply the simple remedy of destroying the non-acid condition by the introduction of clean acid-forming bacteria, and the consequent improvement in quality benefited the farmer and the industry.

In a second case, in which a large supplier of milk to a powder factory requested assistance in locating the cause of persistent poor quality, the Farm Dairy Instructor found that such large quantities of water for cleaning the equipment were being withdrawn from an electric heater as to preclude any possibility of its reaching boiling point at the times required, and this was being done in an effort to observe the utmost cleanliness. He advised a reduction of one half in the quantity of water used in the cleaning operations to ensure that boiling water was applied to the milking machine and equipment, and improvement in milk quality was immediate. This farmer had not recognised that the fundamental requirement in cleaning dairy equipment is the destruction of bacteria and that, in using large quantities of hot water, he was causing the condition he was anxious to avoid.

In a similar case a producer with dairy premises and equipment kept scrupulously clean requested assistance in dealing with a persistent fault in cream quality. Investigation by the Farm Dairy Instructor proved that the quality fault had its origin in bacteria usually associated with equipment, and, although no visible fault in cleanliness could be located, the fault in quality was effectively removed by extra methods of sterilisation.

These cases, which are merely a few in the regular routine of the work of the Farm Dairy Instructor, show the need of an expert link between the dairy factory and producer and to what extent the application of the knowledge and assistance of the Farm Dairy Instructor can assist both in their common objective.

Susceptibility to Taint

Milk and cream offer such a perfect medium for the development and multiplication of bacteria, and are so susceptible to the absorption of any foreign taint, that their fine flavour may be affected or destroyed by influences around dairy premises, in equipment, in fodders, and sometimes in an unhealthy condition of cows. There is a multitude of causes of poor quality, the presence of many of which is not suspected by the farmer. This applies particularly in cases where the quality of the produce is affected by absorbing unusual or foreign smells, to which the operator has become accustomed, around a milking shed.

Good-quality raw produce depends primarily on the cleanliness of equipment and the cleanliness of the air supply with which milk or cream comes in contact. The most palatial and expensive dairy premises will not be the means of producing high-quality produce unless conditions are hygienic and the advice and assistance of Farm Dairy Instructors are directed along these lines rather than in requiring the expenditure of large sums of money in the erection of new buildings. All possible guidance and assistance is given producers in matters relating to farm dairying, including the selection of sites for milking sheds and in planning the layout and construction of dairy premises on modern lines. The service will convey to producers the latest developments of research and practical trial in connection with the efficiency of cleansers and demonstrate the most efficient methods of cleaning milking machines and equipment.

Trial of New Baconer Grading System

By A. LONGWILL, Superintendent of the Pig Industry, Department of Agriculture, Wellington.

TO remedy the unsatisfactory position regarding the grading of pig carcasses that has arisen during the period of meat control a new grading system for baconers is now being given a trial by the National Pig Industry Council at a number of freezing works throughout the Dominion. The trial will cover the whole of the current season, and if the system is considered satisfactory, the council will decide the date from which it will come into operation.

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THE grading system in operation before the war sorted baconer carcasses into three grades. The proportions falling into each grade were 70 to 74 per cent. prime 1, 18 to 20 per cent. prime 2, and 6 to 10 per cent. second quality. Porkers were graded into about 85 per cent. prime and 15 per cent. seconds.

In the last 8 years the proportion of carcasses in the prime 1 grade has increased to 84 per cent., with 12 per cent. prime 2 and 4 per cent. second quality. Those closely in contact with the trade know that there has not been a real improvement in quality to this extent, but that the standards have been relaxed. Further, since all prime pigs are paid for at the same price, only 4 per cent. of the baconer kill is penalised for quality. This penalty is only ⅜d. and the absence of a premium for anything better than "average" has led to the position where the producer is offered no direct incentive to produce superior-quality carcasses.

The National Pig Industry Council set up a committee in 1945 to report on standards for a grading system for baconers. The report of this committee was approved, but action on it was withheld until the annual meeting of the council in 1948, when it was agreed that the system suggested by the committee should be given a trial during the current season to determine its suitability in practice. If it is considered satisfactory by the council, it will be adopted as the new system for grading in the industry. As producers are vitally concerned and ultimately stand to gain most from an effective grading system, they should make their wishes concerning the grading system known through their local district pig council.

Objectives of Grading

As the standards for grading of baconers are being subjected afresh to investigation, it is desirable that the whole question of grading of pigs be considered by all in the industry so that any amendments which may be made to the existing regulations ensure that all requirements of grading are met fully. The objectives of grading are:—

1. To sort pigs into commercial grades according to the requirements of the main markets, thereby achieving the maximum net return for the carcasses from the wholesale buyer.
2. To form a basis for the payment of differentials to producers according to the grade produced, thus providing an incentive to the production of the desired quality.
3. To give the producer as much information as possible on how his pigs are being graded, and if they are graded down, the reasons for it so that he can take the necessary steps to improve the quality of his output.

It will be obvious that any system which lacks any one of these objectives will be ineffective as a means of improving the national level of quality of pig carcasses.

Grading in Practice

Briefly the necessary foundations of a satisfactory grading system must be:—

1. The application of satisfactory grading standards in everyday commercial practice **to all** pigs killed, whether porker or baconer or for export or local market. Otherwise those who wish to evade grading could do so.
2. Efficient supervision of grading practice.
3. All producers receiving a copy of the grading certificate for their pigs. It is hoped that all buyers will agree to purchase on a graded basis, but the objects of the grading system could largely be achieved if buyers identified each producer's pigs so that a copy of the grading certificate could be sent to him after slaughter. The producer would then be in a position to know the faults in his pigs and the buyer would be able to estimate more accurately the hoof value of future lines from the same producer.

Canadian System

The chief pig meat-exporting countries, Denmark and Canada, have realised the need for these essentials in their grading systems and only at the end of 1947 new regulations were introduced in Canada making the system there more effective.

The Canadian system of baconer grading is based on the suitability of the carcass for the production of bacon for the United Kingdom market, with the English No. 1 lean selection as the aim. There are eight grades for baconers, based on degree of fatness and carcass weight. A minimum length requirement is fixed for their A and B grades and a high standard is set for balance, firmness and whiteness of fat, thickness, and even width of belly and fullness of ham.

Though there are more grades than will be required for New Zealand's much smaller production, 30 to 35 per cent. of the total Canadian production is graded A and 46 to 49 per cent. B1. Worthwhile differentials between these grades are paid and pigs in lower grades are penalised correspondingly. The aim in New Zealand should be to divide the present 80 to 90 per cent. primes into something like these proportions and to enable premiums to be paid for the best pigs.

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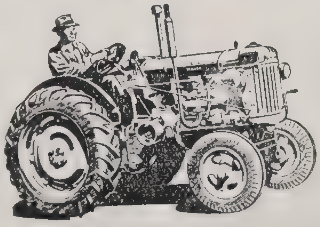

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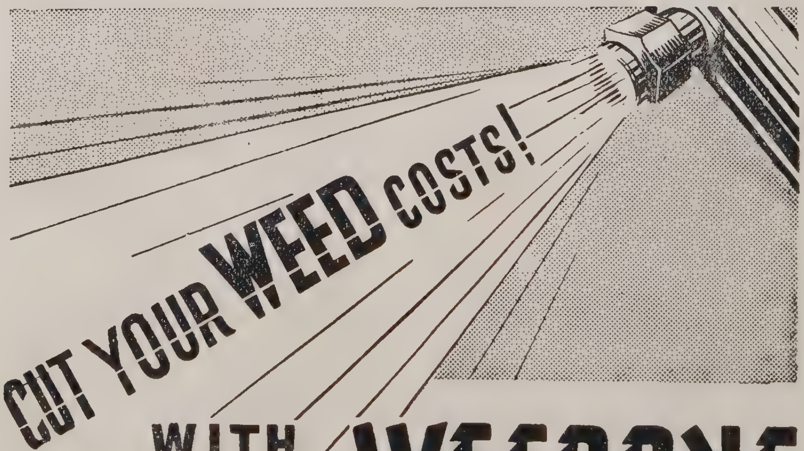
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Members of the Baconer Grading Standards Committee examining carcasses at a freezing works.

hooks grading. The Canadian Government controls the grading and it is incumbent on the slaughter-works operators to send to the producer a statement of the grading when making settlement. This statement indicates by means of symbols why pigs failing to make the best grade possible for their weight have been graded down. This is definitely informative to the producer and, coupled with an effective advisory service and a system of adequate differentials for quality, can be the means of securing a rapid improvement in quality in the carcasses produced.

Danish Co-operative System

Denmark's system has long been very effective in that each producer, being a shareholder in his co-operative bacon factory, is paid according to the grading of his carcasses and also has the incentive of being directly responsible for the quality of the output of his factory, on which his end-of-year bonus depends. Consideration is now being given to the amendment of Danish grading standards to provide for eye evaluation of hams, balance, and general conformation and to the amendment of the present measurement standards.

It is clear that both the Canadian and Danish producer are paid as nearly as possible according to the final market realisation of their produce. Speculation in live pigs is eliminated and the producer receives knowledge which will help him correct the faults in his pigs and the price differential which will encourage him to use this knowledge.

Proposed Grading Amendments

To introduce a new system of grading in New Zealand it will be necessary to amend the existing regulation 10 of the regulations under the Meat Act, 1940. The following is a draft of the proposed regulation in its amended form, on the basis of which a trial is being carried out in 18 works this season:—

REGULATION 10. GRADING OF BACONERS

1. This regulation shall apply only to meat which is derived from pigs slaughtered in an abattoir or meat-export slaughterhouse and only to meat derived from such stock which on inspection by an inspector is passed as fit for human consumption.

2. No person shall sell for export or local consumption or offer for sale for export or local consumption or export or attempt to export from New Zealand the carcass of any baconer slaughtered and passed as aforesaid unless such carcass has been graded and marked as required by this regulation.

3. All grading under this regulation shall be carried out under the direct supervision of a supervising grader.

4. All carcasses of baconers graded under this regulation shall be graded finest selected, finest, or second quality.

5. The standards of the respective grades shall be as follows:—

(a) Finest Selected and Finest

(i) Only carcasses coming within the weight range of 131 to 160lb. shall be graded finest selected. All carcasses graded finest cover a weight range including 121 to 200lb.

(ii) The carcass shall be that of a prime barrow or maiden sow. The carcass shall be free from taint or blemish (except slight blemish) and well finished from leg to hock. The neck and shoulders shall not be too heavy. The flank shall be of satisfactory thickness and the fat shall be white and firm.

(iii) Notwithstanding the provisions of sub-paragraph (i) of this paragraph, a carcass affected by blemish, injury, or other defect which in the opinion of the inspector or grader renders it unfit for export may be included in a prime grade for consumption within New Zealand if otherwise entitled to be so included, and shall in that case be branded with the appropriate grade mark in accordance with clause 8 of this regulation.

(iv) The thickness of the fat at the loin and shoulder measured as in hereinafter prescribed shall not exceed the respective maximum set out (according to the weight of the carcass) in the respective column of the table hereinafter contained.

(v) For the purpose of the foregoing requirements the thickness of shoulder fat shall be measured at the shoulder over the third rib vertebra, and the thickness of loin fat shall be measured at the loin over the last rib vertebra, such measurement being made in either case after the carcass has been backed down or otherwise cut to expose the thickness of fat.

(vi) The following is the table hereinbefore referred to:—

BACKFAT MEASUREMENT TABLE IN 1/16in.

Dressed weight of carcass lb.	Finest selected Shoulder	Finest selected Loin	Finest Shoulder	Finest Loin
	Maximum		Maximum	
121-130	—	—	32	18
131-140	26	15	33	19
141-150	27	16	34	20
151-160	28	17	35	21
161-180	—	—	37	23
181-200	—	—	39	25

(vii) No minimum standards for backfat measurement are laid down, but the grader shall have the power to grade down to a lower grade any carcass carrying insufficient fat for its weight.

(viii) In addition to the fat measurement standards, a finest selected grade must also show a high standard of quality in respect to general conformation (hams, shoulders, and bellies) and quality of fat, and be free from any blemishes.

(b) Second Quality

Carcasses of this grade shall include any carcass which has:—

(a) Excessive discoloration, excessive hair, excessive seedy cut, faulty castration, or excessive bruising.

(b) Any carcass carrying excessive soft or coloured fat.

(c) Any unfinished carcass carrying markedly-insufficient fat.

(d) Any excessively-fat carcass carrying more than the maximum allowed for under finest grade.

NEW BACONER GRADING SYSTEM . . .

6. As soon as practicable after the carcass of any baconer is passed by an inspector as fit for human consumption the grader at the abattoir or meat-export slaughterhouse in which the baconer was slaughtered shall examine or cause such carcass to be examined for the purpose of having its proper grade assigned thereto in accordance with this regulation.

7. Forthwith after examination of the carcass of any baconer pursuant to clause 6 of this regulation the grader shall cause such one or other of the following grade marks as may be applicable to be applied legibly and indelibly to the carcass in the manner prescribed by clause 8 of this regulation:—

For finest selected grade the words finest selected.

For finest grade the word finest.

For second quality grade the words second quality.

8. The appropriate grade mark shall be applied to every carcass of a baconer by means of a rubber-stamp impression or other indelible impression placed on the carcass or on the tag or label required to be affixed to each carcass or separate portion of the carcass pursuant to regulation 5 of these regulations.

9. Notwithstanding the provisions of the last preceding clause of this regulation, the appropriate grade mark shall not be applied to hams or any other portion of a carcass except the side or fore end.

10. Such tag or label shall, in respect of the respective grades prescribed for baconers by clause 4 of this regulation, be of a colour as follows:—

For finest selected: Blue.
For finest: Buff.
For second quality: Red.

11. In any case where the standard of quality of the carcass or any portion of a carcass is not in the opinion of a supervising grader in accordance with the grade mark affixed to the carcass or portion of a carcass the supervising grader shall assign to the carcass or portion of a carcass the grade which in his opinion is appropriate thereto and shall thereupon direct the grader at the abattoir or meat-export slaughterhouse to alter accordingly as hereinafter provided the grade mark theretofore applied to the carcass or portion of the carcass.

12. Where any grade mark is directed to be altered pursuant to the last preceding clause of this regulation the grader shall remove from the carcass or each separate portion of the carcass the label or tag bearing the said grade mark, and replace such tag or label with a fresh tag or label bearing the grade mark in accordance with the grade as altered.

Price Differentials

The following schedule, in which x represents a basic price, shows the suggested operation of price differentials under the system:—

Finest Selected

131 to 160lb.: x + ½d. per lb for quality + ½d. per lb. for weight.

Finest

121 to 130lb.: x
131 to 160lb.: x + ½d. per lb. for weight.
161 to 180lb.: x — 1d. per lb. for overweight.
181 to 200lb.: x — 2d. per lb. for overweight.

Second Quality

121 to 160lb.: x — ½d. per lb. for quality.
161 to 180lb.: x — ½d. per lb. for quality — 1d. per lb. for overweight.
181 to 200lb.: x — ½d. per lb. for quality — 2d. per lb. for overweight.

Trial Gradings

A start was made last October in getting the trial of the proposed system carried out at a number of works throughout the country, but full returns from the 18 works from which the grading results for two days' kill per month are being obtained were not available until November.

Results of the trial to the end of January, 1949, are as follows:—

Month	No. of pigs	Per cent. of total baconers graded			Per cent. of total	
		Finest selected	Finest	Second	131-160lb.	Over 160lb.
October ..	2,297	19	68	13	46	43
November ..	5,630	15	69	16	42	49
December ..	7,187	16	71	13	45	47
January ..	6,090	16	69	15	47	44
Total to Jan.	21,204	16	70	14	45	47

As these months cover the period of maximum feed supplies, during which pigs slaughtered show a high proportion of heavy, overfat carcasses, it is anticipated that the results over the whole period of the trial will show rather a higher proportion of the selected grade and less seconds. Similarly, rather a lower proportion of heavy pigs (over 160lb.) is likely in the final analysis.

Of the total of 21,204 pigs shown in the table above, 9594 are in the desirable weight range of 131 to 160lb. An important fact is revealed by analysis of these. Thirty-five per cent. graded finest selected, 55 per cent. finest, and only 10 per cent. second quality. These can be regarded as a fair average run of pigs as far as their own inherent qualities are concerned. Largely through the marketing of the pigs at the correct stage of growth, management has been responsible for the better grading.

This verifies the point which has frequently been stressed in the "Journal" that the first requirement is the reduction of the average weight of baconers; the ideal would be to get all carcasses within the weight range of 131-160lb. By this means alone the proportion of finest selected carcasses could be doubled. To achieve this next season, however, producers must start immediately breeding the extra pigs that will be required during the flush months of the season.

A salutary warning was given to the industry recently of the importance of weight suitability and quality in maintaining a market for pig meats. When meat rationing was lifted the New Zealand housewife, given a larger range of choice, immediately exercised her preference. The result was that grocers no longer asked for heavy weight in the bacon sides they ordered. The demand has swung completely back to the lean sides, leaving the heavier pigs to be dealt with by the exporter.

This is where the warning to the producer is clear. How long will the exporter be able to dispose of these heavy pigs at remunerative prices? Only as long as the British housewife is not able to exercise her preference. Perhaps in 2 or 3 years the change will come on the overseas market, and when it does it will come just as suddenly as it did on the local market, but in this case there will be no alternative channel for the disposal of these heavy pigs without considerable loss.

That loss will be the producers' and can be avoided only by producing the quality and weight of pig that is in greatest demand on both local and export markets during the next 2 years. To do otherwise would be not only to run an unnecessary risk, but to spoil the reputation of New Zealand pigs on the British market.

The grading system which is now being tried is designed to make it worth the producers' while to take that extra care which is necessary both in selection of breeding stock and in feeding and general management to the production of the superior-quality article which finally is the key to all markets.

The system has been put forward with the full realisation that the producer is the one who is most concerned with the prosperity of the industry and that it is he alone who, if properly guided, can take steps to ensure the improvement of quality.

In conjunction with grading, producers are entitled to premiums for quality and information which will lead to the elimination of faults in the carcasses graded down. It is time they demanded the aid to efficient marketing which the proposed system aims to give.

Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in April as under:—

Auckland—1YA, on May 24, at 12.35 p.m., "Supplementary Feeds," by A. F. Barwell, Supervisor, Bay of Plenty District Pig Council.

Wellington—2YA, on May 19, at 12.35 p.m., "Litter Production," by I. H. Owtram, Supervisor, Taranaki District Pig Council.

Christchurch—3YA, on May 26, at 7.15 p.m. A talk by H. W. McIntosh, Supervisor, Canterbury District Pig Council.

Bulbs and Tubers for Next Season's Flowers

THERE is much to be done in the flower garden at this time of the year, and one of the main operations is the planting out in beds and borders of subjects that will provide flowers and colourful displays during spring and early summer. Foremost among such subjects are the many bulbous plants such as the anemones, ranunculuses, chionodoxas, scillas, snowdrops, hyacinths, crocus, narcissi, and tulips, recommendations for the culture of which are given in these notes for the flower gardener by M. J. Barnett, Director of Reserves to the Christchurch City Council.

THOUGH March is usually recommended as the appropriate month for planting the bulbs and tubers mentioned, planting is often delayed until most of the summer annuals and bedding plants, as well as many of the herbaceous perennials, have passed over and have been cut back by early frosts, thus enabling the flower beds and vacant spaces in the borders to be cleared, dug over, and prepared for the reception of subjects required for spring displays.

As a general rule, all the bulbs mentioned grow best in a deep, rich, well-cultivated soil that has good drainage and does not tend to become stiff or waterlogged during winter. If it can be avoided, no fresh manure should be added to the soil before planting. If the soil requires manure, either to increase its fertility or to improve its physical or mechanical condition, well-decayed substance such as old farmyard manure, stack bottom, or compost should be used, and it should be dug in and buried sufficiently far below the surface that the bulb when planted will be fully 6in. above it. The bulbs should not come in direct contact with the manure, which should be thoroughly mixed and incorporated with the subsoil rather than placed in a distinct layer, as is common when it is dug or trenched. For heavy soil, open or strawy manure should be used, as such material tends to open up the soil and make it more friable; cow manure is better for light and sandy soils because it is cooler and retains more moisture. However, soil that has been well cultivated and manured for a previous crop is usually in better condition and more suitable for such bulbs as anemones, hyacinths, and tulips than one that has just been freshly prepared. If farmyard manure or compost is not available, bone meal or bone flour is a safe artificial fertiliser to use. After the ground has been dug over, this fertiliser should be dusted evenly over the surface at the rate of 1oz. to the square yard and then worked in thoroughly with a fork.

The general rule when planting bulbs is to put them double their depth in the soil—for example, the base of a narcissus bulb 2in. long should be fully 4in. below the surface. In practice, however, the depth of planting depends on the nature and texture of the soil. In very light sandy soils the depth may be doubled to advantage; on heavy soils deep planting would not be advisable. Deep planting is recommended for tulips, top-sized bulbs of which are usually planted 6in. below the surface.

Anemones

Several species and varieties of anemone are obtainable and all are worth a place in the garden. The most popular kind is *Anemone coronaria*, the florists' anemone, which is a native of Palestine and abundant on the Mount of Olives. Authorities consider that this anemone is the lily of the field mentioned in the Scriptures. Though one

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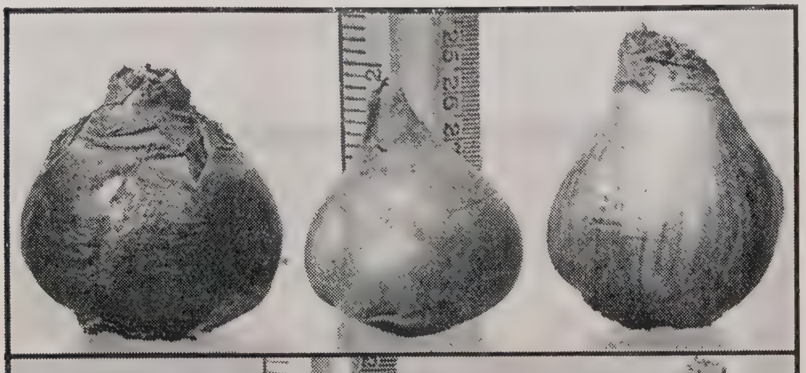
Heading photograph by Green and Hahn Ltd.

of the most brilliantly-coloured spring flowers, it has one great defect: It is very subject to a disease popularly known as anemone rust or anemone wilt. This parasitic fungoid disease causes a general debility in the plants and eventually proves fatal. No reliable cure has yet been found for the disease. Green manure in the soil is said to favour it. Any plants developing the disease should be removed and destroyed at once.

Experience has proved that *Anemone coronaria* succeeds best in a well-drained, moderately-rich, friable loam and in a position that is open but free from draughts and cold currents of air. Cold, shady positions they do not like, nor will they tolerate a wet, sticky soil. Best results have been obtained by planting the tubers in new soil that has not previously grown plants of this class. It has also been found that *Anemone coronaria* and its varieties seldom succeed for more than one season in the same position. Though the plants may give excellent results for the first year after being planted, if they are left undisturbed for a second year in the same soil and position, only a proportion will be worth while and many will be affected with disease. For this reason many growers discard the tubers after the first season's flowering period is over and buy fresh, clean stocks for each succeeding year.



[Green and Hahn Ltd. photos.

Upper—Top-size bulbs of hyacinth (left), tulip (centre), and narcissus (right) which are ready for planting and may be depended on to provide well-developed blooms of good size and substance. Middle—Under-sized bulbs of hyacinth (left) and tulip (centre) which no doubt will flower next season but will have shorter stems and smaller flowers than are expected from bulbs of top size; on the right is a narcissus bulb showing definite signs of splitting into 2 or more bulbs, which cannot be depended on to provide first-class blooms next season. Lower—Small bulbs of tulip (left), hyacinth (centre), and narcissus (right) that may not flower next season but should be planted in the reserve garden to grow on for future use.

For early flowering the tubers should be given a warm situation protected from hard frost and cold winds. In districts where winters are comparatively cold and hard frosts are experienced—that is, frosts sufficiently severe to freeze the ground solid—planting may be delayed until the end of July or early August. In such circumstances the tubers may be started beforehand in a light compost in seed trays in a glasshouse or cold frame and, when conditions become milder, be carefully transplanted to the open; as may be expected, flowering will be delayed until October and November.

The St. Brigid strain of *Anemone coronaria* is considered the most popular type, and several varieties are available. Scarlet Emperor and His Excellency are good, strongly-growing scarlet varieties.

However, other species of anemones are well worth cultivation. Foremost among them is *Anemone fulgens*, the scarlet wind flower. It is one of the most dazzling of all scarlet flowers, and the dark centre of stamen adds to its beauty and attractiveness. As one authority says: "It is impossible to plant this flower wrongly for effect." It succeeds only in a good loam and, though it prefers a well-drained situation, it will not tolerate any dryness at the root, so the soil should be on the moist side. It is often used to advantage as a rock plant.

Anemone apennina is a blue-flowered species admirably suitable for naturalising under deciduous trees or in the open spaces in a shrubbery. The flowers are borne on slender stems or pedicles well above the soft feathery foliage. It prefers a cool soil, but once established it will look after itself if kept free from weeds. It is by no means a difficult plant, but it sometimes suffers at the hands of the over-scrupulous gardener during hoeing operations when the small, rhizome-like tubers are at rest.

Anemone nemorosa is the wild wood anemone of Britain and Europe. Though it is seen to advantage in drifts or masses in the woodland, a small group in a shaded shrubbery is very effective and is most charming in early spring when flowers are absent from the garden. There is also a double form and a blue-flowered variety, *Anemone nemorosa* var. *robinsoniana*, the flowers of which are a beautiful azure shade. It is a gem and one of the best of the genus; a reasonably-moist, cool position on a rock garden where it is protected from the burning rays of the sun suits it admirably.

Anemone fulgens, A. appenina, **and** *A. nemorosa* **all prefer cool conditions, are perfectly hardy, and will succeed in any average garden soil.**

Ranunculuses

As a florists' flower and for general display, the garden ranunculus (*R. asiaticus*) is as popular as the anemone, and the general treatment recommended applies with equal force. Several excellent strains are procurable from seedsmen and nurserymen who specialise in these plants, but for the best results no trouble should be spared in providing a suitable soil for them. It should be worked deeply and thoroughly. The following recommendation is taken from an English authority: "The ordinary soil should be taken out to a depth of 1ft. 6in. to 2ft., some drainage being placed in the bottom if there is a suspicion of stagnant moisture, and the bed filled up with a prepared compost consisting of 2 parts of loam to 1 of leaf soil, and thoroughly decayed cow dung. Plenty of sharp river sand should be intermixed, the compost prepared, and the beds made up some time, if possible, before planting time."

One advantage of the ranunculus over the anemone is that it will withstand full sunlight and, if anything, drier conditions.

Chionodoxas

Among the most adaptable and the prettiest of all the small, early spring-flowering bulbs are the chionodoxas. There are several species, and the following are procurable in New Zealand: *Chionodoxa luciliae*, which has comparatively-large bright blue flowers with a conspicuous white centre; *Chionodoxa sardensis*, which has smaller flowers but more to each stem and of a deeper gentian blue (there are a white and a pink form of this species, both of which are worth procuring); and *Chionodoxa uniflora*, which has only one flower to each stem or pedicle, but the flower of which is larger and of a softer blue. All are perfectly hardy and will succeed in any average soil if it is not too hot and dry. They are natives of the European Alps and are frequently referred to as "glory of the snow" because they burst into flower on the mountainside as the snow is melting in spring. Naturally, they prefer cool conditions, but in warmer districts they may be grown successfully by placing a layer of a cool, moisture-retaining substance such as sphagnum moss about 1ft. below the surface.

The chionodoxas are excellent for planting in small colonies in the cooler parts of a rock garden, under deciduous shrubs such as azaleas, or in the spaces between such hardy heaths as *Erica tetralix* and *Calluna vulgaris*. They have been used with good effect in beds under standard roses, thus providing an effective display in early spring before the fresh growth of the roses has begun to develop.

Scilla

Scilla sibirica is another delightful, blue-flowered, early spring-flowering, bulbous plant that should have a place in every garden, large or small. It is a real little gem, perhaps even more blue in colour than the chionodoxa and just as adaptable.

HARDY HEATHS IN THE FLOWER GARDEN

[*Green and Hahn Ltd. photo.*

THE hardy heaths (ericas) are invaluable as dwarf flowering evergreens in the garden, especially when grouped in the front of a shrubbery, as shown above and in the illustration at the head of this article. All of them are easy of culture and succeed in an open situation and in a light sandy soil that has had plenty of leaf mould or other similar humus thoroughly mixed with it.

Many of the species and their varieties flower freely during late summer and throughout autumn. All of the following are perfectly hardy and are recommended:—

Erica ciliaris; E. cinerea; E. tetralix; E. vagans and its variety Mrs. D. F. Maxwell, which is one of the best; *E. vivellii; Calluna vulgaris*, which is the Scottish heather, and its varieties *alba* (white flowers) and *aurea* (golden foliage); and *Daboecia polifolia*, the Irish heath, which is seldom out of flower at any season.

The recommendations for treatment of chionodoxas apply to *Scilla bifolia*, another good species with several flowers to each stem. It may not have the same grace and charm as *Scilla sibirica* but is well worth while.

Snowdrops

The snowdrop must not be confused with the snowflake, as it often is by the uninitiated. The snowdrop bulb is no bigger than a hazel nut, the foliage is comparatively short and of a glaucous green shade, and the pendant flowers, which appear during the winter and early spring, are the very acme of grace and beauty. The snowflake has a bulb as large as that of the average daffodil, the foliage is green, long, and coarse, the flowers, though pendant and borne on long stems, have not the refinement of the snowdrop's, and they do not appear until mid-spring. Comparing the snowdrop with the snowflake is like comparing a pearl with a cheap bead.

The generic name of the snowdrop is *Galanthus*, and *Galanthus nivalis* is the common snowdrop of the English woodlands. There is also a double variety which is worth procuring. However, other varieties are even better than the type. Among the foremost of them is *Galanthus nivalis* var. *imperata*, which has much larger flowers and is a better plant in every way. *Galanthus elwesii* and its varieties are also excellent, as is *Galanthus byzantinus*, and *Galanthus robustus* is the largest of the genus. Unfortunately, these species are not yet plentiful in New Zealand and procuring them may be difficult. However, many of them are available from private collections, and no opportunity of procuring any or all of them should be missed.

The common or English snowdrop is not very particular about soil, but some of the others grow best in a deep, friable, well-drained loam containing a fair mixture of sharp sand. Once fairly established, they are best left alone. The bulbs rapidly dry out and deteriorate when lifted, so if replanting is necessary, they should not be stored for weeks as should narcissi bulbs.

Winter Aconite

A little-known but perfectly-hardy winter-flowering tuberous plant is the winter aconite, *Eranthis hyemalis.* It is grown extensively in Britain and on the Continent for naturalising in positions such as between or underneath deciduous shrubs. It is a quaint little plant, growing only a few inches high. Each stem carries a whorl or involucre of leaves forming a fringe round the single yellow flower, which develops above and in the centre. The flowers of a clear golden yellow expand fully in the sun and are particularly cheerful in the bleakness of winter when most plants in the garden are dormant. It has been grown in private gardens in New Zealand for many years but does not seem to have found its way into nurserymen's catalogues in any quantity.

One of the main troubles with these early-flowering small bulbs and tubers is that they lose their foliage rapidly with the approach of summer, and when their foliage has gone there is no evidence of their whereabouts, the result being that too frequently they are ruthlessly if unwittingly destroyed by hoe, spade, and fork during weeding and digging. If planted under deciduous shrubs, they do not occupy space required for the summer-flowering plants, they receive the protection of the overhanging branches, the fibrous roots of the shrubs keep the soil in a good mechanical condition, and the bulbs when in flower brighten up what otherwise would be a bare and uninteresting spot at that time of the year.

Hyacinths

The florists' or garden hyacinth will always be a favourite plant in the garden. To grow them to perfection sound, healthy bulbs should be obtained. The soil should be on the light side, deep, fertile, and well drained, thoroughly cultivated, and open in texture. They dislike a soil that tends to become sticky when wet or become hard and lumpy when dry. The situation should receive full sunshine and yet be sheltered from cold and parching winds. Sharp river sand liberally incorporated with the soil helps to give it that friable texture necessary for the well-being of the bulbs.

Retarded bulbs from overseas will succeed the first year after planting, but many of them may be expected to deteriorate in the second year. For that reason some growers procure fresh bulbs each year and discard those that have flowered the previous season.

Tulips

Several types of tulips are now on the market, but for general purposes the Darwin varieties are the most popular. The culture of tulips was dealt with comprehensively by J. P. Hudson in articles in the "Journal" for June and July, 1948. They prefer a soil similar to that recommended for hyacinths.

Plants to Propagate this Month to Ensure a Garden Full of Flowers

Cuttings of tender and half-hardy bedding plants likely to be severely injured or killed by frost and cold winds should be taken as soon as possible. Iresine, fibrous-rooted begonias, agathea, cuphea, and double-flowering lobelia are examples. Young, vigorous shoots make the best cuttings, and if inserted in a sandy compost and placed in a close frame, shaded from direct sunlight, they will take root quickly. In cold districts, if a heated propagating house is not available, the frames require covering with scrim or hessian for protection when frosts are imminent. Should the plants out of doors already be injured by frost, lift and box up a number of the plants and place them in a heated greenhouse; cuttings may be taken of the young growths as they develop. If the work has not been done, it is not yet too late to put in cuttings of pentstemons, violas, pansies, calceolarias, and pinks; the method was described in the January issue.

Lift, divide, and replant herbaceous perennials such as peonies and *Scabiosa caucasica* where it is necessary to increase the stock or move them to a new position. Such plants resent root disturbance and transplant better in autumn while the soil is still warm and they have a chance of making fresh root growth before the cold of winter sets in. Should the soil be dry at the time of planting, soak it well.

Sow outside for early summer flowering such hardy annuals as sweet peas, larkspurs, godetias, clarkias, nigella, and cornflower. Such annuals are better sown in the positions where they are to flower. As the seeds germinate freely, do not sow them too thickly or needless thinning out will be necessary later. Such annuals will easily withstand 12 degrees of frost. Where heavier frosts are experienced some protection may be necessary in winter. If the soil tends to become wet and cold, the seeds are better sown in the warmer and better-drained parts of the garden. Self-sown seedlings of hardy annuals that have come up in the garden may be carefully lifted and transplanted to a suitable situation in the flower border.

Sow under glass cyclamen for early flowering in the greenhouse the following year, and, for early flowering in the open, marguerite and chabaud carnations, antirrhinums, *Salvia farinacea*, and pansies. If sown now, they will be ready for pricking off in a few weeks and, if grown on under glass for the winter, will be ready for planting out during September and October.

Sow, Plant, or Propagate Something Every Month

The virus disease which causes striping of the flowers is spread by greenflies, which act as carriers of the disease. If possible, tulips should not be grown in warm, confined spaces which form ideal harbourage for such pests, but rather in open situations where the air circulates freely. Any evidence of greenfly on the flower buds before they open should be combated with an approved insecticide.

Other Tasks for the Month

As soon as possible plant out into their flowering quarters such **spring-flowering subjects** as wallflower, myosotis or forget-me-not, aubretia, double daisies (*Bellis perennis*), *Alyssum saxatile* and its varieties, primroses and polyanthus, winter-flowering pansies and violas, and in the warmer districts *Primula malacoides* and cinerarias. For early-summer flowering such biennials as Canterbury bells, foxgloves, and sweet william should also be planted..

Rambler roses such as American Pillar, Dorothy Perkins, Lady Gay, and Hiawatha should be pruned now. Endeavour to remove as much of the old wood as possible while leaving the plant sufficient wood to ensure a display of bloom during the following season. The strong growths made during the past summer should be tied in and trained to replace the old growths that have been removed. The lateral growths that have flowered should be spurred back to within 2 or 3 buds of the main stem. Pruning such strongly-growing roses early gives the young wood a better chance to ripen than if pruning were left until mid-winter.

Prepare and sow down new **lawns** and topdress and reseed old ones.

Dahlias that have been frosted or that are taking up space required for spring subjects should be cut over and the tubers lifted, packed in half-decayed leaves, sawdust, or similar material, and stored in a frost-proof shed or cellar for the winter.

Late - flowering **chrysanthemums** grown in pots should be placed under cover to protect the opening blooms from rain, wind, and frost. If necessary, those planted in the open should be protected by erecting a temporary framework above them and covering it with light tent canvas or hessian; during fine weather the covering can be removed. Though these chrysanthemums in other respects are perfectly hardy, the large blooms, especially those known as the large exhibition kinds, are very susceptible to wet and cold and, if not protected, either will be injured by frost or will rot in the centre if allowed to become too wet with rain.

◆

Savoury Vegetable Dishes

By EDITH G. McNAB, Rural Sociologist,
Department of Agriculture, Dunedin.

THOUGH New Zealanders are fortunate in being able to obtain fresh vegetables all the year round, and most people, particularly those living on farms, can grow their own, it is not possible to include the quantities recommended by nutritionists for adequate diets if vegetables are served only at dinner. The inclusion in the tea or lunch menu of savoury vegetable dishes several times a week will not only safeguard the family against a possible lack of some vitamins and minerals, but will give variety to meals.

GREEN vegetables are best boiled to retain as many minerals and vitamins as possible and the most attractive appearance. A small quantity of salted water should be brought to the boil in a saucepan before adding the prepared vegetables, which should be cooked as quickly as possible, the lid being left on the saucepan. Leafy vegetables should be cut up **before** cooking; if they are chopped after cooking, there is a greater loss of vitamins.

Root vegetables may be boiled or steamed, and some kinds may be baked. When possible the skins should be left on these vegetables whether they are boiled, steamed, or baked, for there is less loss of nutritive value when they are thus protected, and the skins may be removed after cooking.

In the following recipes all measurements are level, and standard measuring spoons are recommended. As white sauce and buttered crumbs are used in several of the recipes, directions for preparing them are given first.

White Sauce

2 tablespoons of flour
2 tablespoons of butter (for some savoury dishes bacon fat can be substituted)
½ teaspoon of salt
⅛ teaspoon of pepper
1 cup of milk

Method 1: Melt the butter in a saucepan, add the flour, and stir the mixture until it is smooth. Cook it for a short time, but do not allow the flour to brown. Add the liquid a little at a time, stirring smooth after each addition. Bring the mixture to the boil, then remove it from the heat. When making a larger quantity or when cooking on a coal range it is an advantage to heat all but a little of the milk before adding it to the butter and flour.

Method 2: If butter or other fat cannot be used, omit it, but use the same proportions of the other ingredients. Mix the flour, salt, and pepper to a smooth paste with a little of the cold milk, heat the rest of the milk to boiling point, and pour it into the paste, stirring constantly. Return the mixture to the saucepan, and heat it until boiling point is reached, stirring all the time. Sauce with a better flavour is produced by the first method.

Buttered Crumbs

Bread for buttered crumbs should be 2 or 3 days old. Rub the bread on the medium part of the grater. Use 1 tablespoon of butter (or other fat) to 1 cup of crumbs, or 1 teaspoon of butter to 1/3 cup of crumbs. Melt the fat, add the crumbs, and toss them with a fork until the fat is absorbed evenly by the crumbs. A little salt and pepper may be added. Buttered crumbs form a crisp topping for savoury dishes and provide a pleasant contrast to mixtures of vegetables and sauce.

Creamed Vegetables (3 to 4 servings)

2 cups of cooked vegetables
1 cup of white sauce

One kind of vegetable may be used alone or a mixture of vegetables may be used. When making up the mixture consider the colour combination as well as the flavour. Carrots or green peas are useful in providing colour contrasts. Dice the vegetables if they are large. Left-over vegetables may be used as well as freshly-cooked ones. Mix them with the sauce, reheat them, and serve them on toast or fried bread. To make scalloped vegetables put the mixture in a casserole, top it with 1/3 cup of buttered crumbs, and brown it in a moderately-hot oven (375 degrees F.)

Vegetables au Gratin

Prepare the ingredients as for creamed vegetables, but add ¼ to ½ cup of grated cheese (prepared on the coarse part of the grater) to each cup of sauce. Top the mixture with buttered crumbs and brown it in the oven. Cauliflower or celery is particularly good prepared this way, but almost any vegetable or mixture of vegetables may be used.

Vegetable Pie

Line a pie plate with short pastry and either prick it well or place a circle of paper on the pastry and use barley or beans to weight it down and so keep the pastry in shape. The paper and weighting are removed after cooking. An alternative is to turn the pie plate or a sandwich tin upside down, fit the pastry on the outside, prick it well, and bake it. When it is cooked, fill the pie crust with hot, creamed, mixed vegetables. Garnish the pie with a small sprig of parsley.

SAVOURY VEGETABLE DISHES . . .

Curried Vegetables

Use mixed, diced vegetables such as potatoes, carrots, parsnips, celery, and onions and add ¼ teaspoon of curry powder to each cup of white sauce.

Casserole of Vegetables

For 5 people use about 2½ to 3lb. of prepared mixed vegetables. The combination could be 1lb. of potatoes and 4 to 8oz. of whatever other root vegetables are available, the amount depending on the strength of the flavour. Peas are a good addition. Dice the vegetables and put them into a casserole, adding about 2oz. of bacon cut into small pieces, seasoning, and stock or tomato puree or juice to cover two-thirds of the depth of the vegetables. Cover the mixture and bake it in a moderate oven (350 degrees F.) until the vegetables are cooked; about 1½ to 2 hours will be required.

Cauliflower a la Creole

2 cups of tomato puree or juice (bottled or tinned)
2oz. of fat
4 tablespoons of flour
1 teaspoon of salt
⅛ teaspoon of pepper
1 teaspoon of mustard
4 tablespoons of finely-chopped onions

Brown the onions in the fat, add the flour, and make the sauce by the same method as that described for white sauce. Cook a cauliflower whole by standing it in a saucepan with the stalk end down and using the method described for green vegetables. Pour the sauce over the cauliflower, which should be well drained, and serve it at once.

Vegetable Custard

About 1lb. of vegetables
2 cups of milk
2 beaten eggs
Salt and pepper

Left-over vegetables may be used or fresh ones cooked. A mixture of carrots, peas, and onions is good. In winter other vegetables can be used to replace the peas. Dice the vegetables, place them in a casserole or piedish, and pour the custard over. Bake the mixture with the dish standing in a pan of water until the custard is set, which takes about an hour at 300 degrees F. Cheese may be added to the custard if desired. Use about 4oz. for this quantity of custard.

Spinach Custard

2 cups of cooked spinach, put through a sieve
1 cup of milk
1 small onion, minced or chopped very finely
3 eggs, slightly beaten
Salt and pepper

Combine the ingredients and cook according to the directions for vegetable custard.

Spinach Pie

Use the spinach custard mixture and fill a cooked pie shell, baking the pie until the custard is set.

Spinach or Carrot Ring

Cook the spinach custard in a greased round tin, setting a small, flat-bottomed basin in the centre. When the custard is cooked remove the basin, turn the custard out carefully on to a plate, and fill the centre with hot, creamed vegetable, creamed cooked rabbit, or other meat.

For carrot ring substitute 2 cups of mashed, cooked carrot for the spinach in the recipe. When it is cooked fill the centre with any of the three fillings suggested above or cooked green peas sprinkled with chopped mint.

Vegetable Souffle

1 cup of milk
3 tablespoons of flour
3 tablespoons of fat
1 teaspoon of salt
⅛ teaspoon of pepper
3 eggs
1 cup of sieved or finely-chopped vegetable
1 teaspoon of very finely-chopped onion

With the milk, flour, fat, salt, and pepper make a sauce according to the directions given for white sauce. Separate the yolks from the egg whites. Beat the yolks, add them to the sauce, and mix in the vegetable and onion. Beat the egg whites stiffly until the tips of the peaks formed when the beater is lifted still just fall over. Fold in the other ingredients. Turn the mixture into a baking dish and cook it in a moderate oven (375 degrees F.) for 50 to 60 minutes. Garnish it with a small piece of parsley and serve it immediately. If

[Sparrow Industrial Pictures Ltd. photo.

Vegetable pie with filling of creamed carrots and onions.

[*Sparrow Industrial Pictures Ltd. photo.*

Upside-down vegetable cake of potatoes and carrots with a border of green peas. (Half the quantities given in the recipe will serve 3 persons.)

the family is fond of parsnips, a souffle can be made with parsnips.

Upside-down Vegetable Cake (5 to 6 servings)

8oz. of flour
3 teaspoons of baking powder
½ teaspoon of salt
2oz. of fat
1 beaten egg
¾ cup of milk
4 cups of mixed vegetables
½ cup of vegetable stock
2 tablespoons of butter

Sift the dry ingredients and cut the fat into the mixture. Mix in the egg and milk. Grease a shallow baking tin with the butter, arrange the hot vegetables in the pan (it may be possible to make a pleasing pattern with different colours of vegetables), pour the hot stock over them, and put the batter on top. Bake the cake in a hot oven (425 degrees F.) for 20 to 25 minutes and turn it out on a hot plate with the vegetables uppermost. Serve it with brown sauce.

Brown Sauce

2 tablespoons of fat
3 tablespoons of flour
1 cup of meat stock
½ teaspoon of salt
Pepper
Few drops of Worcester sauce

Make as for white sauce, but brown the flour in the fat.

Vegetable Loaf

¾lb. of carrot
4oz. of parsnip
3lb. of potatoes
2oz. of celery
⅓ cup of tomato (puree or juice)
1 teaspoon of salt
Pepper
6oz. of swede
1 beaten egg
6oz. of onions
2oz. of roasted and minced peanuts

(Weights are for prepared vegetables.)

Mince the onion, chop the celery, and cook and mash the other vegetables (left-overs may be used). Mix all together with the beaten egg and tomato puree. Put the mixture into a greased loaf tin and bake it in a moderate oven (350 degrees F.) for 30 minutes. Serve with brown sauce, tomato sauce (made as for white sauce, with tomato juice or puree substituted for the milk), or onion sauce. (The onion in the loaf may be reduced if desired when onion sauce is used.)

Onion Sauce

1 cup of minced onion
4 tablespoons of fat
4 tablespoons of flour
2 cups of milk or stock

Cook the onion in the fat before adding the flour. If using stock, brown the onions and flour, which should be increased to 6 tablespoons, but do not brown them if using milk. Finish making the sauce in the manner described for white sauce.

Boston Baked Beans (3 to 4 servings)

1 cup of haricot beans
3oz. of bacon
½ teaspoon of salt
½ tablespoon of treacle
1 tablespoon of sugar
¼ cup of boiling water
½ teaspoon of mustard

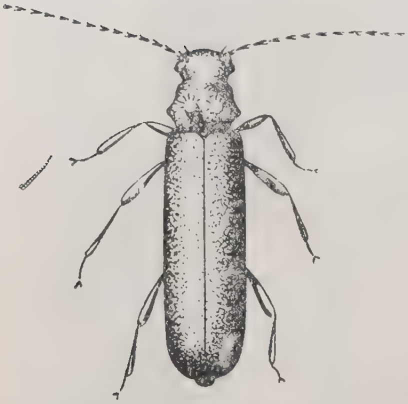
Soak the beans overnight, drain them, and cook them in water until half done. Put the beans in a casserole with the bacon and seasonings, dissolve the treacle and sugar in the water, and pour them over the beans. Add water to cover the mixture. Put the lid on the casserole and bake the beans for 6 to 8 hours, removing the lid for the last hour. Alternatively the beans may be cooked for 40 minutes in a pressure cooker.

Potato Omelet

5 slices of bacon
14oz. of cooked and diced potatoes
4 well-beaten eggs
½ teaspoon of salt
Pepper
1 cup of milk

Bake or fry the bacon till it is crisp. Add the potatoes to the fat and brown them slightly. Place the mixture in a shallow baking pan and pour over it the eggs mixed in with the milk and seasonings. Bake it in a moderate oven (325 degrees F.) till set. Place bacon slices on top of it before serving.

6d. each
paid for these
BORER
BEETLES



Note prominent hump on each side of head with large swelling on top . . .

TWO-TOOTHED
LONGHORN

(AMBEODONTUS TRISTIS—do not confuse with lemon tree borer.)

DISTINGUISHING FEATURES:

The two-toothed longhorn beetle is ½" to 1" long and narrow bodied. Dark reddish colour with thin and irregular covering of fine short yellow hairs. Just below the head there is a broad conical spine sticking out each side. On top of each spine there is a shining round swelling. Minute warts cover the back. The head is pitted with numerous holes. Beetle exit holes from timber are oval and up to 1/3" across the widest diameter.

Probably the most destructive borer in New Zealand. Life cycle is at least 5 years, possibly 12-15 years. Thus the 1" long grubs have plenty of time in which to do damage. Burrows may extend many feet through joists, studs, flooring, wall boards, etc. without breaking surface. Beetles shun strong light and prefer to emerge on the underside of timber SO LOOK UNDERNEATH THE HOUSE. Beetles frequent old macrocarpa stumps and are prevalent in houses built on old bush areas. No real research has been done in N.Z. on longhorn eradication and the Boracure Laboratory will pay 6d. each for the first 5,000 live beetles sent in, with a special prize of £10 for the largest individual collection.

Beetles must be kept separated as they seize each others legs and antennae and won't let go. Pack in individual containers (preferably tins) or separated by several thicknesses of paper. Wrap securely and send to The Laboratory, Boracure (N.Z.) Ltd., P.O. Box 632, Wellington. State number of beetles sent, print your name and full address.

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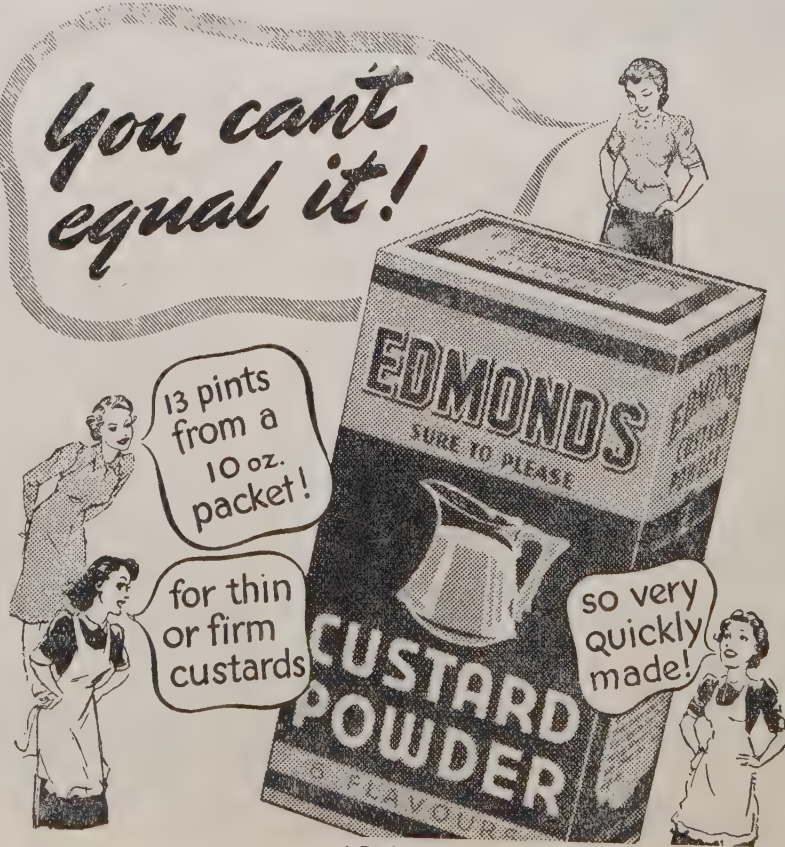

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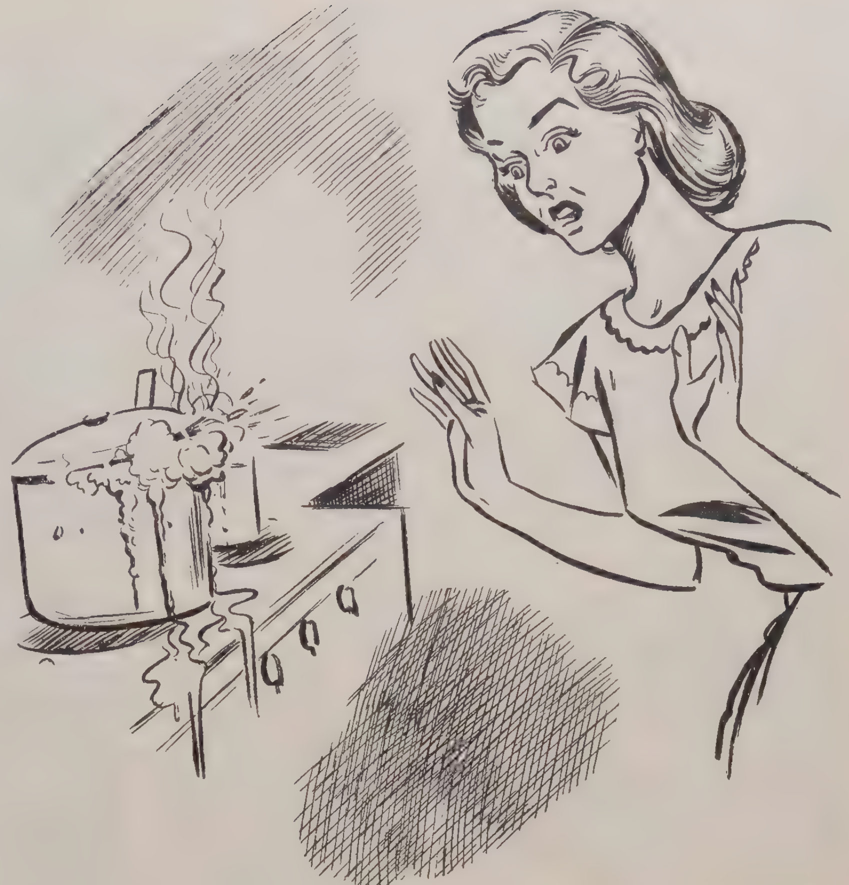
CLEANING KITCHEN UTENSILS

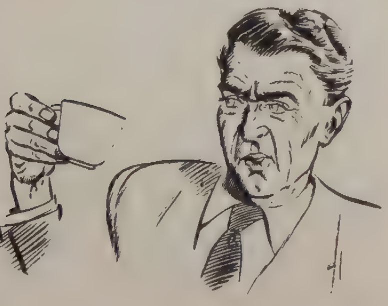
EVEN in the best-run households accidents such as badly-burnt saucepans or forgotten casseroles left in the oven occur now and then, but these are not catastrophes if the method used for removing the charred remains does not also spoil the surface of the utensils beneath. In this article Eirene Unwin, Rural Sociologist, Department of Agriculture, Dunedin, describes some useful methods for dealing with these and other all-too-familiar kitchen cleaning problems.



IN each case the aim of the treatment recommended is to remove the burnt-on food without further roughening the material of which the utensils are made.

Stains on Enamel and Earthenware

After years of use the bottom container of a double saucepan frequently becomes brown inside with mineral stains from the water boiled in it. Similarly, enamel teapots and enamel jugs, too small to be cleaned inside with a pot scrubber easily, may become stained brown with the years. Not only do they look dirty, but the stains in a teapot seem to flavour the tea rather unpleasantly.



However, removal of these stains is easy, it being necessary only to soften the deposit before scrubbing it off. Do not attempt to scrub off the stain without softening it, as this is unnecessarily hard on both the hands and the enamel surface.

To soften the deposit put 1 to 2 teaspoons of washing soda into the article to be cleaned, fill it with hot or boiling water, and stand it on the stove where it will keep hot for several hours, though it need not remain boiling. Jugs and teapots may be stood inside a saucepan of soda water, and one treatment then does for both. After several hours tip away the soda water and wash the article, using a scrubber if necessary to remove all traces of the now-softened stain. The soda water must be washed off completely, as it has a very unpleasant taste.

This treatment is less damaging to the enamel surface than scrubbing all the stain off with a copper pot scrubber or steel wool, and certainly is less damaging to the hands.

Tea stains on earthenware teapots may be removed in the same way, though usually a great deal may be scrubbed off quite easily from the glazed surface without previous softening. The teapot would need to be immersed in a saucepan of soda water, as it should not be put directly on a hot part of the stove for fear of crazing the glaze. Do not use an aluminium saucepan for this purpose, as the soda causes the aluminium to turn black.

WASHING
SODA

Burnt-on Stains on Casseroles

To avoid burnt-on food stains on glass and earthenware casseroles, remove cooked food from them as soon as possible after they are out of the oven, and put them to soak, if necessary in the sink half full of cold water, so that the outside top edges are kept wet as well as the inside. Do not reheat food in an already-used dish, for that is inviting trouble, but if food is served in the dish in which it is cooked, put away any left-overs in a clean dish and put the used one to soak as soon as possible. Leave it soaking for several hours if necessary until all the food is soft and peels off easily.

However, if the casserole in time should become really stained, it may be soaked in hot water in which soda is dissolved or, if possible, boiled in a large saucepan of soda water—about 1 teaspoon to a quart. The largest casseroles may be boiled in the copper, though it would be wise not to let them touch the sides or bottom of the copper, which might become hot enough to crack them.

Burnt Saucepans

Different methods should be used for cleaning enamel and aluminium saucepans which have been burnt, and it is most important that each method be used only for the correct material, as otherwise the results may be regrettable.

Enamel: If an enamel saucepan has been burnt really badly, there may remain a black stain on the bottom that defies all soaking and scrubbing with an ordinary pot scrubber. Almost always it can be removed by dissolving 1 to 2 tablespoons of soap powder in hot water in the saucepan and boiling it Fairly-long boiling may be needed, but in time the black will flake off the bottom and the saucepan may be rinsed and will be clean. Do not let the saucepan boil dry in the process, or the burnt soap will also have to be removed. The original burn will have weakened the enamel, which in time may chip off, but this method of cleaning does not further weaken it. It should not be used for aluminium because the alkali in the soap powder will blacken it.

SOAP POWDER

Aluminium: This method may be used for aluminium, but must not be used for enamel. Clean the saucepan as thoroughly as possible by ordinary methods so that, except for the black burn stain, it has no grease or any other food remnants on it inside or out. Do not use a harsh abrasive on the burn, as it is less harmfully cleaned off as follows: Dry the saucepan, and put it on a cold or cool stove top or hot plate, or in a cold or warm oven, but not too hot a one. Heat the blackened saucepan slowly until it is very hot and, because the charred food of the burn and the metal saucepan expand by different amounts with the heating, the burn flakes off. Cool the saucepan slowly, and the burn and metal contract by different amounts and the flaking off continues. By this means the whole of the charred stain may be removed and as long as the heating and the cooling are slow, little or no harm is done to the saucepan. If there is any other dirt on it, especially grease, this will merely burn on during the treatment, and the saucepan will finish looking worse than when it began.

The method described for aluminium may be used to clean the bottom of an electric oven in which fruit or other food has boiled over. Merely turn the bottom element of the oven on high, open the windows of the kitchen—as the smell may be considerable—and leave it until the mess has burnt black and bubbles appear in it. Then turn off the stove, and as it cools the charred food will flake off and may be removed easily.

If enamel saucepans are heated dry, the enamel and the iron beneath it tend to heat and expand at different rates and by different amounts and the enamel may flake off the iron in large chips, so the dry-heat method must not be used to clean enamel.

If either an enamel or an aluminium saucepan—in fact, any utensil from a casserole to a frying pan—should boil dry, do not attempt to cool it with water. Even boiling water is very much cooler than the hot, dry saucepan; it will at once be turned to steam on touching it and may sputter dangerously, and steam burns can be bad. In addition, the quick cooling causes rapid contraction of the saucepan material, and is almost certain to cause chipping of enamel, again because of the uneven contraction of the iron and the enamel coating. The rapid contraction would crack a glass casserole, and possibly even an earthenware one.

In all such cases of boiling dry let the utensil cool slowly until it is cold enough to handle. Then soak it and, if necessary, boil it in soda as already described.

Black Stains on Aluminium

If by mistake soapy water or other alkaline material should be boiled in an aluminium saucepan, it will leave a bad black stain. This is caused by the effect of the alkali on the small quantity of iron which is always present as an impurity in commercial aluminium, and it is not really harmful but only unsightly. The stain may be removed by boiling in the saucepan a dilute acid which neutralises the alkali and reverses its effect, leaving the aluminium shiny again.

As in neither case is aluminium actually dissolved, there need be no fear of aluminium impregnating the food being cooked in the saucepan. Acid fruit may be stewed in it to remove the black stain, and the fruit may safely be eaten. Rhubarb and gooseberry are both very effective. Failing fruit, vinegar and water may be used, but vinegar is a very weak acid and should not be diluted too much. Unless the vinegar is kept and used again, its use becomes somewhat expensive, and stewing acid fruit in the blackened saucepan is recommended in preference.

Brown Stains in Teacups

A brown stain can be removed from the inside of a teacup by wetting it, sprinkling salt into it, and rubbing this over the stain with the fingers or a cloth. The stain will be taken off easily and well, and the glaze of the cup will be in no way injured.

Avoiding Damage to Utensils

The principle behind all these special cleaning methods is to attack the stain by the process that is least harmful to the material of the utensil. Soap and water are sufficient for all ordinary dish washing. Loosely-adhering food scraps, such as porridge or the last vestiges of a shepherd's pie, which do not come off readily with a dish mop can be scraped off easily, after adequate soaking, with a wooden scraper which cannot scratch or harm the saucepan or pie dish. A broken clothes peg makes an excellent scraper and is far better to use than an old knife or spoon, which is certain to scratch the utensil. For stubborn spots a pot scrubber is useful, but anything that resists the scrubber should not be attacked with something harsher. A knife or old spoon can have disastrous results on the inside surface of a saucepan, making crevices and scratches that cause endless trouble later.

When faced with really-bad stains or burns, go straight to the method that attacks the stain itself with no ill effects on the surface of the utensil. Do not add to future cleaning problems by roughening the surface with a harsh abrasive.

ROYAL VISITORS TO NEW ZEALAND

H.R.H. the Prince of Wales.

THE visits to New Zealand of H.R.H. Prince Alfred, Duke of Edinburgh, in 1869, and of Their Royal Highnesses the Duke and Duchess of Cornwall and York in 1901 were described in the two previous articles in this series which appeared in the February and March issues of the "Journal." This article continues the series by Enid B. V. Phillips on Royal Visits to New Zealand and describes the tour of

The Prince of Wales

THE day the Duke of Cornwall and York reviewed the troops in Auckland his children watched their grandfather, King Edward, present the medals at a big military display in London, Lord Roberts being the first recipient. Twenty years later the Duke's eldest son, now Prince of Wales, who had been present at that London parade, officiated at similar ceremonies during his travels in the Antipodes. The battle cruiser Renown which brought the Prince to New Zealand was the biggest ship to sail these waters, and seen from the shore as she slowly glided into her berth in the Waitemata Harbour she looked like some gigantic silver-grey bird. The clamorous cheering of the Auckland crowds, which His Royal Highness acknowledged by standing on the seat of his car and waving so energetically that two equerries had to hang on to his coat tails to stop him from falling out, contrasted sharply with their hushed solemnity the next day when a slender, fair-haired Prince, in familiar khaki, stood among them at the Anzac Service to honour the memory of the gallant dead.

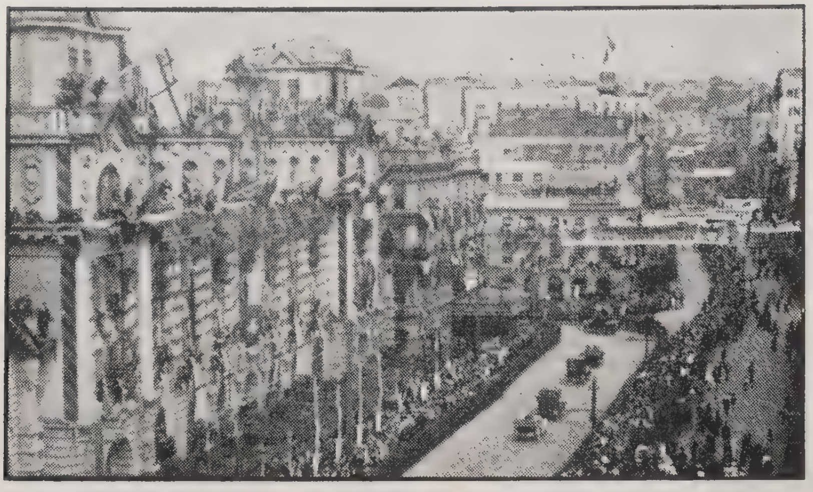
Such was his fame among the New Zealanders who had fought in France and Gallipoli that everywhere he went the returned men turned out in full force to meet him. (Indeed, the Mayor of one of the most prosperous North Island towns wore his gunner's uniform in preference to his official robes when receiving the "Digger Prince.") Despite the injury his right hand had received through over-hearty hand-gripping on his Canadian tour some months before, he had a smile and a handshake for every soldier presented to him. Nor did he forget the wounded and disabled, often going out of his way to visit those in hospitals, passing from ward to ward to chat informally with the patients.

Maori Ceremonial Dances

The Maori Pioneer Battalion, commanded by Te Rangihiroa (Major Peter Buck, D.S.O.), lined the route at Rotorua and there was a special parade of Maori troops, including a detachment of cadets from Te Aute College, and Sir James Carroll again led his people in ceremonial dances and chants of welcome. Besides the huia feathers and mats betokening his high rank, the tikis and tewhatewhas "of great antiquity," they brought him modern gifts, such as an ashtray and cigarette-holder of greenstone, a carved pipe inlaid with paua shell, and a set of greenstone liqueur glasses.

The threatened hitch in his tour owing to the railway strike was successfully overcome by the mediation of the Prime Minister, the Rt. Hon. W. F. Massey, who, although recuperating from a recent illness, undertook a tiring trip to Wellington to confer with the railwaymen's representatives. Thus, after only a 2-day delay, the Royal train was enabled to proceed. Even the smallest stations sported flags and bunting in honour of His Royal Highness and in the larger centres where his stay might be timed for part of an hour—or a day—the people acclaimed his progress with flowers, ranging from exotic orchids to humble wild flowers gathered by eager, childish hands. Sometimes these floral offerings descended on him in such showers that he had to use his hat as a shield and his equerries became quite accustomed to being almost totally obscured by the big armfuls of bouquets they had to carry back to the train. Many a time the whole procession came to a halt when the Prince stopped his car to accept personally a nosegay for his buttonhole from some small child, and his popularity among the juvenile population grew to practically legendary proportions.

The Auckland children arranged themselves to spell the word "Welcome" in living letters across the Domain; later they filed into line and formed the British flag. Taranaki Scouts submitted their bridge building for the Prince to test in person, and a little Maori lass from Carterton wove him a mat with the help of her mother. At Masterton he signed his autograph for the small "sailor-girl" who, with a sedately-worded speech, handed him a golden souvenir spade with which to plant a commemorative oak, her youthful assistant bearing a silver bowl of soil; and the children of the Wairarapa presented



[*Alexander Turnbull Library photo.*

Auckland gave the Prince a vociferous welcome as he travelled up Queen Street after landing from the Renown.

their address on a gold tasselled cushion of purple velvet. The Reefton children's salutation was read by a schoolgirl, the Prince receiving a gold nugget from one of the youngest lads on behalf of his fellow-scholars.

In Christchurch the Christ's College boys had voluntarily sacrificed part of their vacation to stay on at the school when the Prince made his inspection and His Royal Highness was delighted with the impromptu haka they performed for his benefit. Even the very youngest members of the local Caledonian Society greeted him in Highland costume and while the pipes skirled a welcome he talked with the tiny daughter of the president as she demurely proffered him a bunch of heather beribboned with the Black Watch tartan; and the discomfiture of a diminutive bugler who sounded a note at the wrong moment during the military display at Hagley Park was considerably diminished by the Prince's cheerful conversation with him. The children of Cashmere Hills stretched a rope of flowers and ribbons across the road to halt the Royal car while their "Mayor," arrayed in miniature chain and robes and a top hat nearly as tall as himself, and accompanied by an equally Lilliputian "Mayoress" and "councillors," presented an address to His Royal Highness with the solemn dignity befitting such an important task.

In Dunedin a delegation of 18 girls, dressed in white, was deputed to convey to the Prince an inkstand of greenstone and silver with a pedestal base carved in the Maori manner, purchased by the pupils of the Otago schools out of their pocket money. The medical students, carrying bones instead of banners to designate their calling, their leader being equipped with a complete human skeleton, gave him a riotous reception as they escorted him to the hospital to view some of the remarkable achievements of New Zealand's premier plastic surgeon, Colonel H. P. Pickerill, in restoring to normalcy the features of soldier-patients with severe facial injuries.

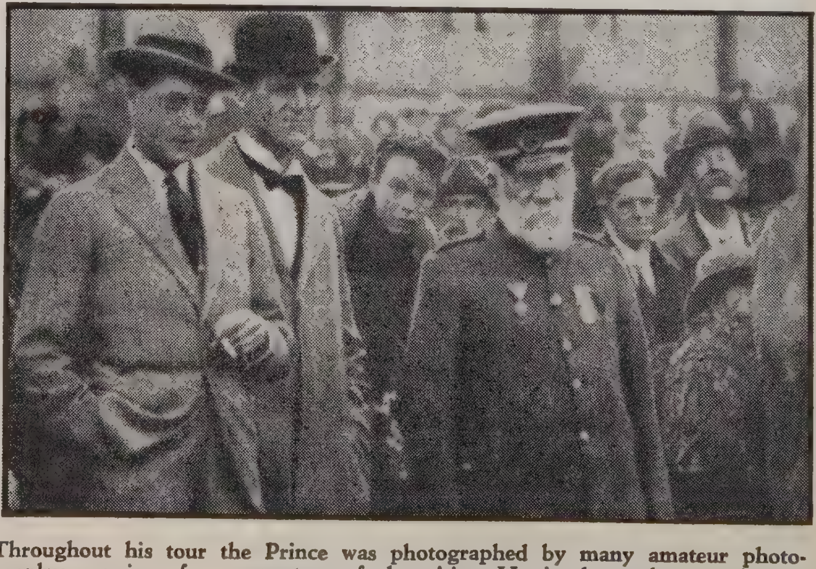
Prince's Enthusiastic Interest

One of the Prince's most endearing traits was his enthusiastic interest in every activity in which he engaged, whether it be dancing his favourite fox-trot at a State ball or shovelling coal into the engine furnace and taking his turn on the footplate of the Royal train; riding on a merry-go-round at a fair (this resulted in such an influx of patrons of the Royal "boat" that the sideshowman reaped a small fortune) or grinding out a tune on an old barrel-organ reposing in an early colonists' museum; posing obligingly for armies of amateur photographers (once he even sent his Chief of Staff, Rear-Admiral Sir Lionel Halsey, to assist one girl who was too nervous to hold her camera straight!) or driving his car at high speed along the most dangerous stretches of the winding West Coast roads. (The driver of the coach in which His Royal Highness, as a box-seat passenger, crossed the wind-swept mountain route between Otira and Arthur's Pass (for the Otira tunnel, destined to be the longest tunnel in the British Empire, was still in the process of construction) was Mr. Alex Hall, the 79-year-old partner in the coaching firm, the whip he flourished so proudly being a present from the Duke of Edinburgh when he drove him from Bendigo to Melbourne in the late 1860's. The sole woman to act as chauffeur to the Prince in New Zealand was that tireless worker for the "boys in blue," Miss G. Ewen, M.B.E., who took His Royal Highness by car from the Trentham Station to the Military Hospital and back.)

Lighter Moments of Tour

Even the most formal functions the Prince attended had their lighter moments, as, for instance, the civic reception in the capital's Town Hall, the foundation-stone of which had been "well and truly laid" by his father, when the citizens continued to sing the National Anthem long after the organist had ceased playing that portion of the anthem customarily rendered at public gatherings; and the Petone pageant depicting the country's early history was constantly interrupted as various sections of the audience vented their joy at the Prince's presence by outbursts of cheering, and the young pig which was to have played a part in the scene featuring Captain Cook's arrival in New Zealand escaped from its box and created a diversion by running among the crowd and evading capture!

In his farewell message to the people of New Zealand the Prince said: "I feel myself a true New Zealander in heart; I look upon you . . . as my own kith and kin."



Throughout his tour the Prince was photographed by many amateur photographers anxious for mementoes of the visit. He is shown here posing in New Plymouth with a veteran of the Maori War.

The Effect of Body Weight on Health

By EVELYN E. MOORE, Rural Sociologist, Department of Agriculture, Auckland.

NOT so very long ago it was taken for granted that the shape anyone might have—no matter how unweildy or cadaverous he might appear—was conferred on him by Nature and that all he could do was to make the most—or the least—of it by wearing suitable clothes. Now everyone is aware that by dieting or exercise, or both, it is possible to lose weight, but those who are definitely over-weight are perhaps not all equally sure that it is to the great advantage of their health and well-being to do so.

PROBABLY because of the many useless, unpleasant, and even harmful ways of losing weight which have been advertised by the patent medicine trade and others, the idea is frequently met that weight can be lost only at the expense of health, or by enduring a period of always feeling listless, hungry, and irritable. In addition, it is often supposed that the effect is only temporary, the person gaining weight again even more rapidly after the diet or treatment is discontinued. When that does occur, it is usually the result of a poor reducing diet which leaves its followers so weak and hungry that they return to a normal diet with such enthusiasm and relief that they over-eat markedly.

Extreme under-weight, especially if the person is younger than 30, is no more beneficial to health than over-weight, and it reduces resistance to infectious diseases, particularly tuberculosis. Therefore, in any consideration of the total effect of food on health, the amount eaten can be equally as important as the quality or nutrient content.

That fact has been proved strikingly both by the experience of doctors and by the statistics of life insurance companies, which show that the person of normal or average weight has the greatest expectancy of long life, as well as being less susceptible to many of the typical diseases of middle and late-middle age such as diabetes and diseases of the heart, blood vessels, and gall bladder. The more nearly the weight approaches the average, the greater is the nervous stability, vitality, and freedom from infectious diseases.

Normal Weights

Two questions arise immediately in any discussion on dieting for either reducing or gaining weight: First, what can any person consider to be the average weight for his age, size, and build; and, second, is the average weight of a great many people necessarily the ideal weight to maintain for the best possible health.

The average weights for height and age generally have been compiled by life insurance companies and are taken from sufficiently-large numbers to be representative. These figures have been noted by doctors, the health and weight of patients and others have been compared with the average, and approximately ideal weights for adults have been deduced. In them allowance is made for the person of particularly-broad build, who may weigh 10 per cent. more than the average before he reaches his ideal weight, and for the lightly-built person, who may reach his most health-promoting weight at a figure 10 per cent. below the average.

That a child's weight has an important effect on health is also well known. The Plunket Society has compiled height and weight tables for pre-school children which are known to most mothers. Average weights for school children have also been collected, for the obviously under- or over-weight child, like his adult counterpart, is less likely to be healthy and is often more susceptible to childhood ailments than the child of normal weight.

The following table shows the best weights for height for adults. They are averages for 30 years of age, as most people tend to be slightly too thin in youth and to gain weight excessively during middle age.

MEN					WOMEN				
Height			Weight		Height			Weight	
ft.	in.		st.	lb.	ft.	in.		st.	lb.
5	0	..	9	0	4	10	..	8	4
5	2	..	9	4	5	0	..	8	8
5	4	..	9	10	5	2	..	8	12
5	6	..	10	4	5	4	..	9	5
5	8	..	10	12	5	6	..	9	12
5	10	..	11	7	5	8	..	10	6
6	0	..	12	4	5	10	..	11	0
6	2	..	13	2					

Excessive thinness is often caused by faddiness or a fear of becoming fat, and can be remedied by sufficient amounts of a well-balanced diet, with perhaps special emphasis on food of high nutritive and energy value. The over-weight person, on the other hand, requires a special diet, and this article is concerned with the treatment of such a condition.

Causes of Over-weight

What constitutes a definite degree of over-weight which ought to be treated cannot be defined very easily. In general, an increase of more than a stone in weight during middle age is distinctly disadvantageous, and excessive weight in a younger person is also to be avoided. A weight more than 10 to 15 per cent. greater than the ideal (the average weight at 30 years) is inadvisable if good health is an aim of life.

The fact that so many people gain excessive weight during middle age, and that others (though they are a much smaller percentage of the over-weight people than is generally realised) are over-weight because of thyroid or other gland abnormalities, has perhaps led some people to regard their extra pounds philosophically as a more or less inevitable accompaniment of middle age, especially if over-weight is a family trait. They may even assume that it would be disadvantageous to their health to reduce their weight somewhat, whatever the predisposing factors may be.

However, the fundamental cause of over-weight is the regular consumption of more than sufficient food for the general requirements of the body for work, exercise, and other functions. All the fat, starch, and sugar and sometimes much of the protein eaten is digested, absorbed, and converted in the body into heat and energy for muscular activity, the surplus being stored, mostly as fat, a certain amount of which is essential for health and fitness; only an excessive store of fat is harmful.

Perhaps the second most important cause of over-weight is insufficient exercise or manual work. Even when walking slowly (at about 2½ miles per hour) a person uses about twice as much energy as when sitting reading or sewing. Therefore a change to sedentary work, or even retirement from active sport, may cause a rapid gain in weight, for the retired athlete

[*Sparrow Industrial Pictures Ltd. photo.*

One complete day's reducing menu. If desired, 1 or 2 extra servings of fruit or green vegetables may be included. The menu contains 2 cups of coffee and 2 of tea to provide 1 pint of milk, which may be included in any other way desired.

or labourer often finds difficulty in accustoming himself to the smaller meals which are all that are required to maintain his weight when he is less active.

Though fundamentally over-weight must be attributed to eating more food than can be conveniently used at once, the question might well be asked why some very energetic people find putting on weight easy, though apparently eating no more than other slim and perhaps under-weight members of the family. In most instances this tendency to stoutness has no more mysterious causes than such common traits as an unusually good appetite and digestion, a habit of eating between meals, an easy-going and inactive temperament, or an ability to store even a slight surplus of food intake as fat. Such apparently-innocuous practices as drinking several cups of sweetened tea each day (6 level teaspoons of sugar each day in excess of energy requirements theoretically would be equivalent to a gain of about a stone of fat in the course of a year), or a preference for plenty of butter and jam on bread, or an occasional chocolate or handful of nuts and raisins, or even sweetened fruit drinks and soft drinks in summer, may be responsible for a very slight but steady increase in weight which, if it is maintained, results in a definite degree of over-weight.

Only in a very small percentage of cases—some doctors estimate it at 1 per cent. or less—is over-weight the result of gland abnormalities. In these cases other signs of ill health are invariably present as well, and they should always be confirmed by a doctor, who will give the requisite treatment. The uncontrolled consumption of any slimming patent medicine which contains glandular extracts such as thyroxin may have a very serious effect on health, even though it may cause weight to be lost.

Diet the Only Safe Way

So many so-called remedies for over-weight have been advocated by commercial enterprises and diet faddists during the past few years that some people may have gained the impression that, though the reducing diet is one way in which to lose weight, it is one of the least pleasant and, so the advertisers of other methods would have them believe, least effectual ways.

On the contrary, all the mechanical aids to weight reduction, including rubber garments and massage (which is much more likely to reduce the weight of the masseur or masseuse than that of the patient), have no effect on the total weight at all, though they may redistribute the fat to other parts of the body. Nor are the various "salts" or laxatives and other reducing remedies in tablet form to be recommended. They are either quite harmless and ineffectual, or effectual possibly at the expense of the health of the patient, for some of them contain thyroxin, which in dosages not regulated by a doctor may cause the development of symptoms of a toxic goitre, such as undue tiredness, nervousness, and palpitation.

Exercise alone is also rarely a satisfactory treatment, for not only is a sudden change to active exercise sometimes unwise for the sedentary, middle-aged person, but it also increases the appetite, so that, unless the same or a smaller amount of food is eaten, it is doubtful whether any weight will be lost at all.

The use of a well-planned reducing diet, prepared on the same basic plan as any other well-balanced diet, is the only safe and healthful method of losing weight. The diet should contain adequate amounts of all the essential nutrients—that is, vitamins, minerals, and protein—but include fewer of the foods which are particularly rich in energy value—that is, fattening value for the over-weight person. Foods such as sugar, sweets, pastry, cakes, and all fats (except butter), the only value of which is that of energy providers, should be eliminated.

Food Fallacies

One of the chief faults of many reducing diets is that they are not balanced and, in addition, may be much more unpalatable and monotonous than necessary, making the results unsatisfactory in many cases, for very few people could follow them for sufficently long for them to be of benefit. Other faults in such diets include unnecessary restriction of the variety of food eaten, or starvation days; only fruit and green vegetables may be permitted, or bananas and skim-milk, or instructions may be given to drink only orange juice or eat water crackers 2 or 3 days each week, the rest of the diet being left to the patient's discretion.

Misapprehension about the nature of certain foods is also frequent, perhaps because of advertisements which state that certain products have slimming or fattening properties; some, amazingly enough, claim to be able to do either, according to which is preferred.

Some of the more common fallacies are that water crackers are slimming, that toast is not as fattening as bread, and that drinking with meals or eating salt is fattening. In all these cases, as in the case of foods which people on reducing diets are often told to avoid at all costs—such as potatoes and milk—the "fattening" value depends entirely on the calorie or energy value of the food or drink. Pure water, black coffee or tea, and salt contain no calories at all, and therefore cannot be fattening, though they may increase weight temporarily because slightly more water is present in the body.

An examination of the calorie value of other foods leads to the conclusions that toast made from 1oz. of bread has exactly the same calorie value as the bread; that 1oz. of water crackers (about 4 or 5 of medium size) contains 133 calories and 1oz. of bread (1 thin slice) 72; and a glass of whole milk (5 to 6oz.) contains 90 to 100 calories and a medium-sized potato (3½oz.) about 80 calories, showing that the relative fattening value of milk and potatoes has been much exaggerated.

Planning a Reducing Diet

The chief aims when planning a reducing diet are therefore:—

A low calorie or energy value.

A sufficiency of minerals and vitamins.

A relatively-high protein content, for protein, as well as being required in the same way as minerals and vitamins, also stimulates metabolism—that is, the rate at which the body uses up food to provide heat and energy.

Good variety and attractive service.

Good satiety value.

Thus the foods to use frequently include green vegetables and those of high water content, fruit (fresh or stewed without sugar), clear soups, tea (without sugar), coffee (without sugar and not made with coffee essence), skim-milk, lean meats (roasted, boiled, grilled, or stewed; stews should not be thickened), eggs, cheese, and vegetable and meat extracts if desired.

Foods which may be eaten in small amounts are bread (preferably whole-meal), porridge (without sugar), potatoes and other root vegetables, the daily butter ration, and, for variety, simple desserts such as junket, and all custard and gelatine preparations, provided they are not sweetened with sugar or thickened with cornflour. Saccharine may be used for sweetening if desired, but should not be cooked for long, as it develops a bitter flavour.

Foods which should not be eaten include fat meat or bacon, thick soups, all predominantly-cereal savoury dishes and puddings such as macaroni cheese and tapioca or sago, all fried foods, salad dressings (vinegar or lemon juice may be used, however), thickened gravies and sauces, all cakes and desserts other than those mentioned in the previous group, all sweets and sugar, pastry, cream, beer and other alcoholic drinks (all of which provide calories or energy), ice cream (unless made at home without sugar), and biscuits (including water crackers). Water crackers may be used very rarely to substitute for some of the bread eaten; as their vitamin content is very low, they should not be eaten regularly instead of bread.

Suggested Menus

How much food a reducing diet should contain depends to some extent on the individual, for the person who is doing hard manual work, or the busy farm housewife who perhaps does outside work as well, requires rather more food than the less active person. In fact, the energetic person with a good appetite may find that a suitable amount of weight can be lost by eliminating morning and afternoon tea meals, all sweets, sugar, jam, cakes, steamed or boiled puddings, pies, and sauces from the menu, and, if hungry, increasing the amount of fruit or green vegetables eaten.

Too rapid loss of weight is unwise. A loss of 1 to 2lb. per week (and the lower rate of loss is better) safeguards both health and appearance and, incidentally, is less likely to induce the not-always-tactful barrage of criticism of diets and dieters from friends and acquaintances.

A reducing diet for a sample day's menu for the person of average activity follows. The loss of weight on such a diet may vary considerably in different people during the first 1 or 2 weeks as the body becomes accustomed to the changed regimen. If after that time weight is being lost either too rapidly or too slowly, slightly more or less of the energy-producing foods, such as bread and potatoes, may be eaten. A pint of skimmed milk, the daily butter ration, 2 thin slices of bread, 2 or 3 pieces of fruit, and water are included as desired.

Breakfast: 1 average-sized grapefruit, without sugar; one cup of porridge, without sugar; skimmed milk; one boiled egg; milk coffee, without sugar and not made with coffee essence.

Morning tea: 1 cup of tea, with milk if desired.

Lunch or tea: Fish, with cucumber and tomato salad in lettuce cups, as much as desired; lemon juice or vinegar dressing; 1 or 2 thin slices of wholemeal bread; butter; yeast extract; tea or coffee without sugar.

Afternoon tea: 1 cup of tea; 1 thin slice of bread and butter from the day's ration if desired.

Dinner: 1 generous plateful of clear vegetable soup; 3 to 4oz. of lean roast beef; 1 small boiled potato (2½oz.); 1 medium-sized carrot; cabbage as desired; orange and chinese gooseberry dessert.

Supper: 1 glass of milk.

Ways of varying the daily reducing diet include:—

Breakfast

Any fresh or stewed fruit (except bananas) without sugar may be used instead of grapefruit.

Half a slice of toast may be substituted for porridge, or part of the daily bread ration may be included.

Eggs may be poached or scrambled, or eggs (not fried) and bacon (a small lean piece, grilled) substituted occasionally.

Grilled tomatoes and bacon, and bacon and apple sauce, are other alternative breakfast dishes.

Lunch

Other suitable salad vegetables include spring onions, radish, cabbage, carrots, celery, and cress. Small servings of beetroot are also allowable.

Cheese (1 to 1½oz.) or a small serving of lean meat may replace the fish.

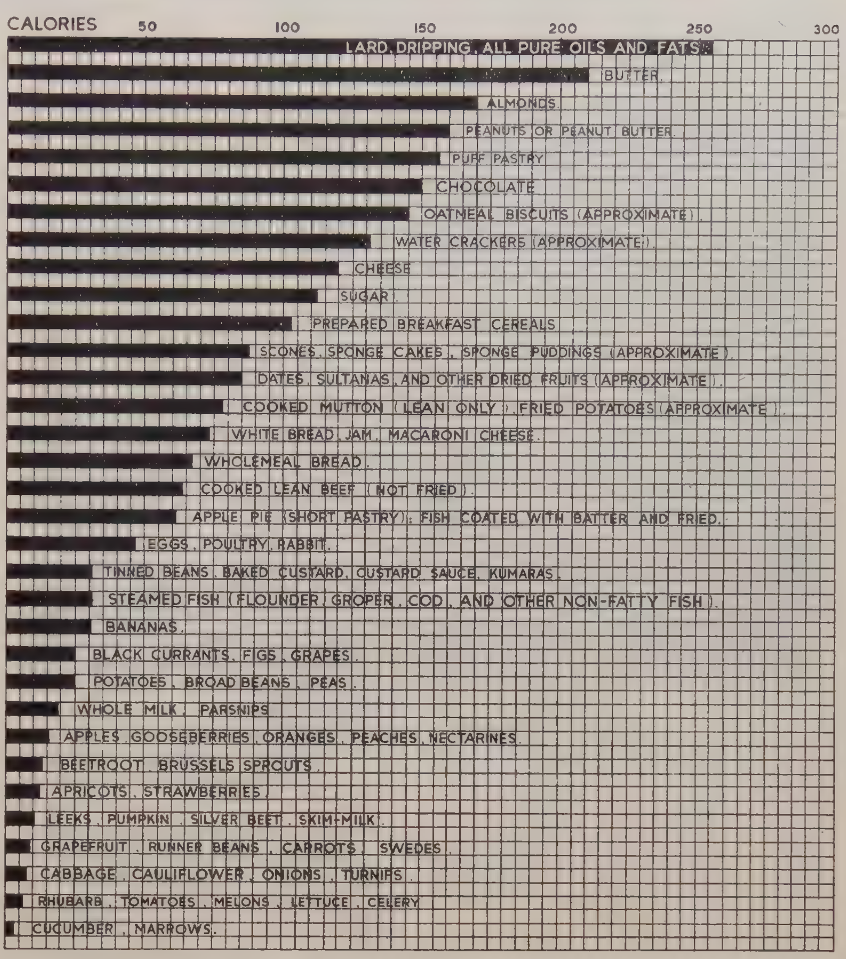
Cooked vegetable dishes (provided they are not thickened), an egg, or thin soup are often a welcome change in cold weather.

Dinner

Any lean meat, roasted, grilled, boiled, or stewed (not thickened), may be used.

Most green vegetables (including french and runner beans), and celery, cucumber, marrow, mushrooms, onions, radishes, tomatoes, and turnips are of low energy value and may be eaten freely. Beetroot, brussels sprouts, carrots, or pumpkin may be served once each day, but, as they are of moderate energy value, should not be eaten too freely.

Approximate Calorie Value (energy or fattening value) of 1oz. of Some Common Foods



Broad beans, corn, peas, potatoes, kumaras, parsnips, and yams are all of relatively-high energy value compared with other vegetables, so that if a small serving of potato is desired, the others should not be included in the menu, though they may be substituted for potatoes.

Some milk may be made into simple milk desserts such as junket, custard, and spanish cream.

As most fruits have an energy value comparable with that of root vegetables, they should not be eaten in unlimited quantities, 2 or 3 average servings each day being sufficient to maintain health. Some fruits, such as bananas, figs, grapes, and plums, have an energy value approaching or greater than that of potatoes, so that they should be eaten only occasionally and in small servings.

Not to be Undertaken Lightly

A reducing programme should not be undertaken lightly by anyone, for people of normal weight, or slightly in excess of it, especially if they are naturally of stocky build, are likely to lower their strength and resistance to disease by reducing to the point of thinness or under-weight. Nor is it always wise for the extremely overweight person to reduce without first consulting a doctor, for a modified form of diet may be required.

To reduce weight successfully the diet must be kept to strictly, for the penalty of breaking it even slightly—for instance, by continuing sugar in tea—may well be a failure to lose weight, which is most discouraging to anyone who may have conscientiously followed the main features of a diet.

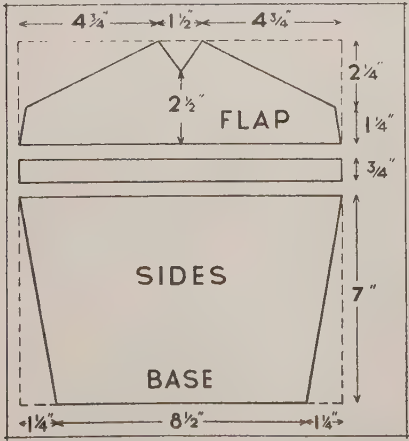
When the desired amount of weight has been lost a return to the old dietary habits obviously will result in the weight which was lost being regained. Consequently the food intake should be increased gradually, until just sufficient is eaten to maintain weight at a level nearer the average for height and age.

The reducing diet, which is varied and contains adequate amounts of all "protective" foods—that is, foods which provide the protein, minerals, and vitamins essential for health, such as milk, vegetables, and wholemeal bread—should benefit the general health and vitality of the over-weight person.

A Roomy, Hard-Wearing Handbag

THIS handbag, which is roomy, hard wearing, and combines a luxurious appearance with economy, needs only simple materials and is easy to make.

MATERIALS required are a piece of fabric 27in. by 13½in.; a piece of thin cardboard 8½in. by 2¼in. for the base, and pieces for the sides, top strip, and flap cut according to the diagrams; a piece of lining material 27in. by 13½in.; one large and two small curtain rings; two large press studs; ¾ yard of 1in.-wide belting for the handle; liquid glue, and adhesive tape.



Begin by joining the cardboard base lengthwise to the base of the front and back, using adhesive tape so that the joins bend. Join the top strip and flap together, then join them to the top of the back as shown in the diagram. Using the cardboard as a pattern, lay it on the material and cut out, leaving ½in. turnings. Also cut out two strips 2¾in. by ¾in. for the gussets.

Stick the material to the cardboard, using very little glue. Slash round the surplus material, stick it over on the inside, and leave it to dry completely. Take a small turning all round the gusset pieces, insert these at right angles to the base, and slip stitch them to the base and sides.

Stitch the two small curtain rings inside each end of the top strip so that half of the ring shows beyond the edge. Cut a 3in. length of belting, slip it through the large ring, and stitch the ends together. Sew half of a press stud on to the belting just below the ring. Glue it in place inside the centre of the flap edge. Sew the other half of the stud on to the bag to correspond.

Cut a 21in. length of belting, halve it lengthwise, and glue the wrong sides together to make a double thickness. Sew one end 2in. below the top edge of the gusset, slip it through the rings on the top strips, and stitch it at the other side 2in. from the top. Hide these joins with a small strip of material.

A small purse to match can be made from a piece of canvas 8½in. by 3in. Shape one short side into a point and cover it with material as for the handbag. Point the ends of the remaining belting and glue it down the centre of the purse, matching the points. Fold the sides into a 2¾in. pocket and oversew the edges. Sew on a press stud to fasten it.

Country Girls to Hold First Conference this Year

PREPARATIONS for the first national conference of the New Zealand Federation of Country Girls' Clubs are now being made by club members throughout the Dominion. The conference will be held at Christchurch during 4 days of the school holidays in August, when club representatives will have the opportunity of meeting other members and will discuss the aims and activities of their organisation.

At the general meetings of clubs now being held plans are also being made for the programme of monthly meetings and other club activities. These include practical instruction in such subjects as farming, the farm home, and things to make. This instruction is given through talks, demonstrations, and discussions, in which help is given by officers of the Department of Agriculture. Descriptive talks on other topics and debates are to be arranged and where possible films are to be shown. Field days to factories and hospitals, helping "good causes," and sports and social evenings enable club activities to combine education, recreation, and community service. Each club is selecting a special officer to be a delegate to the Dominion executive committee and she is to act as the club's link with the federation.

The federation is often known as the sister organisation of the New Zealand Federation of Young Farmers' Clubs. When country girls sought to join young farmers' clubs three years ago the young farmers responded by helping them to form a similar organisation for girls between the ages of 14 and 30. The first club was formed in 1946 and the federation was established in August, 1948, Mrs. B. Jarman, of Darfield, being the first president. Inter-club debates are held between country girls and young farmers and the two Dominion executive committees exchange delegates. Valuable co-operation has been given by country women's organisations who are represented on the federation's executive, and the clubs' advisory members are usually members of Women's Institutes or the Women's Division of Federated Farmers.

Though perhaps the youngest and smallest federation in New Zealand, the enthusiasm of its members augurs well for its expansion. Clubs have been formed wherever girls have a common interest in country life—in the country, in small towns, and in schools. Girls in isolated areas may join in by correspondence. The friendship, worthwhile activity, and social life of a club appeal to girls whose life on a farm may be lonely or who, having left rural homes to work in towns, miss their familiar background.

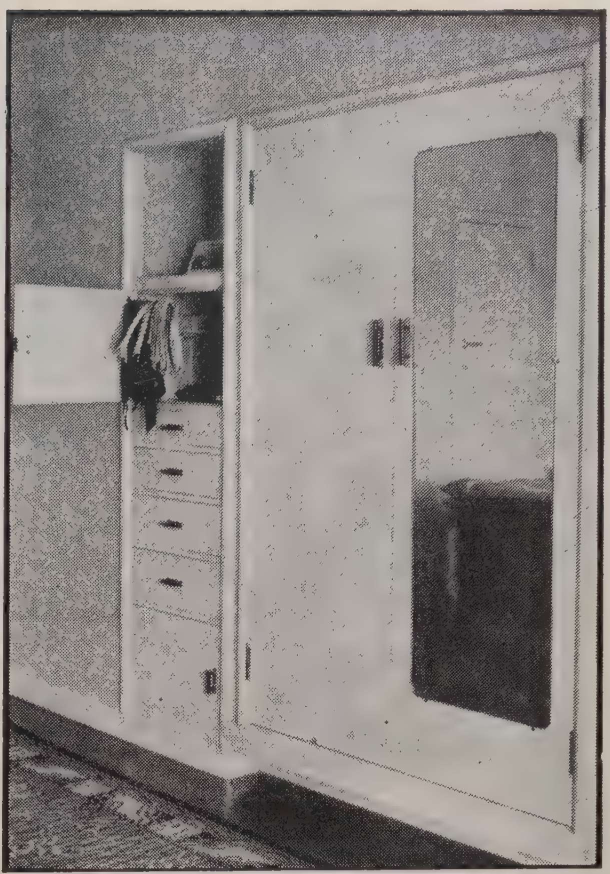
If in any district there are girls or women between the ages of 14 and 30 who are interested in joining or forming a club, they should write to the Secretary, New Zealand Federation of Country Girls' Clubs, P.O. Box 3004, Wellington. They will receive a leaflet about forming a club, together with suggestions for activities and copies of the "Country Girls' Newsletter."

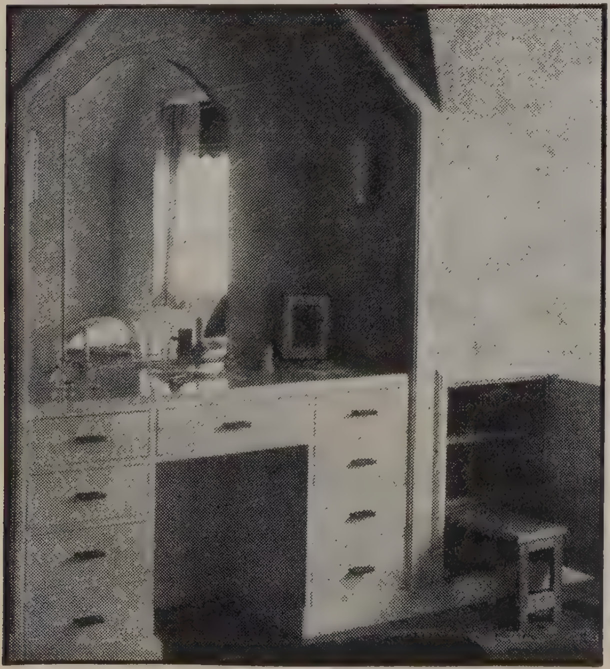
STORAGE SPACE IN THE HOME

THE audience is sure to laugh when, in a cartoon or comedy, one of the characters pulls open a cupboard door and is immediately enveloped by the overflowing contents. Such an incident, humorous on the screen, is annoying and even dangerous in real life. Serious accidents have been caused by broom handles, by boxes falling from insecure stacks, and by people tripping over objects which have been left about because there is no place to put them out of the way. This article by Norma K. Metson, Rural Sociologist, Department of Agriculture, Wellington, is for the habitual mislayers who can never find a safety-pin or fox fur when they want it, for the members of the "drop it and leave it lying" brigade, as well as for the housewives who have "so many cupboards in the kitchen I never know which one I've put things in".

THE farm home has outbuildings where lawnmower, garden tools, workshop equipment, bicycles, and step-ladders have to be kept—articles which in town houses may have to be accommodated indoors. However, space for household stores needs to be larger. In old houses the storage space is usually provided in detached pieces of furniture such as wardrobes, chests of drawers, and trunks, and frequently in an unfurnished spare room or attic which in time, and in the absence of ruthless throwing out, may accumulate an astonishing collection of possibly-useful or utterly-useless objects. New houses have built-in cupboards, and architects and builders find that one of the first demands of a client and best selling points of a house is plenty of cupboards.

However, too many cupboards of the wrong shapes and sizes, or in inconvenient locations, can be just as annoying as too few. When a new house or improvements to the facilities of an old one are being planned the following questions should be asked: What is to be stored? How and where should it be stored? Why should it be stored in this way? The answers will provide a list of the articles requiring storage as distinct from those continually in use or on display, and will provoke thought about the best place in the house and the most appropriate form of storage for each article. Use (whether daily, special occasion, or seasonal), size, and the need for any particular care are the chief criteria for classifying.





[Sparrow Industrial Pictures Ltd. photos.

The set of bedroom storage units illustrated on this page was planned as an integral part of the house. Features are the large wardrobe, the arrangement of drawers and cupboards, and the cupboard specially designed for shoes.

Following are the main items for which storage must be provided in the average household:—

Clothing: Indoor and outdoor, work clothes and best clothes, clothes which are outgrown, worn out, or out of fashion.

Houshold linen: Bed linen, towels and face cloths, tea towels; table linen regularly in use, and that kept for special occasions; extra blankets and bed covers stored during summer, old sheets and blankets.

Soiled clothing and linen to be washed or dry cleaned.
Furniture and furnishings: Card tables, leaves for dining table; deck chairs and furniture used outdoors in summer; loose covers not in use; play-pen, cot, pram, small child's chair or table.

Toilet and medical supplies: Cosmetics, bathroom supplies and equipment; first-aid kit, medicines, household remedies; poisons and drugs, which should be kept in a locked cupboard.

Recreational and educational equipment: Musical instruments and music, gramophone and records, books and magazines, equipment for children's hobbies, toys, indoor games, sports equipment, camping equipment.

Home maintenance: Cleaning equipment and supplies, tools, spare parts (for example, light bulbs), flower bowls and vases, suitcases, special decorations.

STORAGE SPACE IN THE HOME

A storage wall of cupboards built in an old kitchen.

Special Devices in the Kitchen

A row of hooks or nails on a wall or the inside of a cupboard door are a first approach to classified storage. Most small equipment can be hung as it is; if no provision for hanging has been made, an eyelet can be screwed into wooden handles. More elaborate racks in metal or plastic can be bought, some of these having spring clip devices adaptable to holding handles of various sizes.

Step-up shelves: Small packages which are stored one behind another in kitchen or bathroom cupboard are a continual annoyance. A step shelf arrangement with 3in. width and 3in. rise will keep order and make it easier to see where things are.

Revolving shelves: Known colloquially as "Lazy Susans", shelves which revolve on a central shaft save both space and energy if they are installed in kitchen cupboards which take a right-angle turn, either above or below bench level. As the shelf is turned, articles from the back of the cupboard are brought to the front within easy reach.

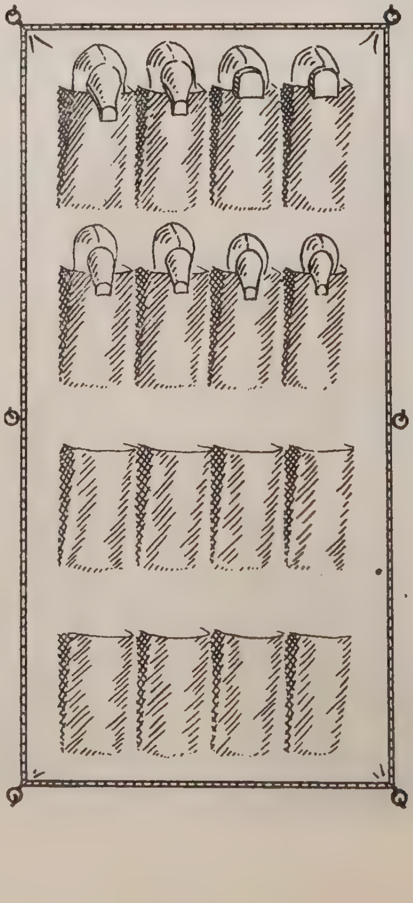
Drawers for flour and sugar eliminate the danger of bins which may slam shut on the fingers, but they must be specially constructed to slide in and out easily, and stopped so that they cannot be pulled right out by accident.

Vertical files: Trays, shallow baking tins, girdles, and similar items are most conveniently kept in slots made with vertical partitions 4in. apart.

Shoe Holders

Shoes are very difficult to keep tidy. If left on the floor of a built-in wardrobe, they soon get out of order and collect dust, and at the bottom of a detached wardrobe they are likely to dirty the hems of clothing hanging above. Tightly-closed drawers or boxes are unsuitable, as they prevent the access of air. Shoe bags or racks fastened at one end of a wardrobe or on the back of the door are most satisfactory.

A shoe holder for 8 pairs of shoes can be made from scrap material. Strong, heavy cotton in a dark colour is most suitable. For the back of the holder take a piece of material 48in. by 18in. and make a ½in. hem all round, or finish the edges with bias binding opened out and stitched on flat. Then cut 16 pieces 12in. x 9in., bind or hem 1 long edge for the top, and press down a turning on the other 3 sides. Fold the bottom edge as for a box pleat, and tack it across. These pieces are then stitched on to the backing in position to form pockets, in 4 rows of 4, with base lines 12in. apart. The 2 sides of the pockets are stitched 4in. apart, and the top corners should be reinforced with triangular stitching. Fasten the completed holder to the wall with tacks, or sew on 8 curtain rings, 1 at each corner and 1 in the centre of each side, and attach these to hooks.



Each pocket normally holds 1 shoe, though it may take a pair of sandals or flat slippers. The sizes given are for women's shoes; for men's make the pockets a little wider, and for children's a little shorter. The total size and shape of the holder can be modified if required. Racks can be made from dowelling or light battens arranged to catch the heels and support the toes of the shoes.

For gumboots and shoes worn for outdoor work, a slatted shelf can be installed under cover near the back door.

Drawers for Clothes

Most dressing tables and tallboys are designed with drawers which are too deep to be really convenient. High piles of clothing tend to fall over, or must be dug into to find a particular garment, and much space is wasted if articles are spread in shallow layers. One deep drawer is needed for heavy woollens; a medium depth with internal divisions is suitable for underwear; handkerchiefs, scarves, gloves, and small items will stay tidiest in shallow, partitioned drawers or small drawers of their own. Unfortunately, elaborate subdividing makes furniture expensive, but something can be done in standard furniture by the use of open cardboard boxes or thin plywood partitions for internal dividers. A storage chest featured in recent overseas magazines has sliding doors and cut-away trays instead of drawers. One side contains underclothing and accessories, and includes for men 4 and for women 6 small shallow drawers. The other side has space for shoes and women's purses. Between the 2 sections of the men's tallboy is a rack for ties which slides in and out.

A fitted wardrobe which includes drawers and shelves as well as hanging space can be designed to hold all clothing, and saves space in a small room, as the only other requirement is a shelf for toilet articles with a wall mirror hanging above. In an old house with a high stud, the top portion of a built-in wardrobe may be partitioned off separately and used for suitcases, boxes for old clothing, and other seldom-used items.

Sewing Cupboard

A sewing cupboard needs 2 large drawers, one for new materials and the other for scraps; some method for filing patterns; accommodation for working tools, cottons, and trimmings; and room for hanging garments in course of construction. If space is limited, make use of the back of the cupboard door for pegs for cotton reels, racks for patterns, and hanging pockets for laces, bindings, and fastenings.

If the machine is portable, keep it in the sewing cupboard on the floor or a strong shelf.

REPAIRING AN UPHOLSTERED CHAIR

BROKEN springs, a torn cover, wobbly legs, and padding wearing thin do not mean that an upholstered chair is fit only for the scrap heap. All defects may be repaired, resulting in what appears to be a smart new chair, and if the repairs have been done well and good materials used, there is no reason why the chair should not last as well as a new one. Four typical defects occur in old chairs, and directions for dealing with each are given in this article by Eirene Unwin, Rural Sociologist, Department of Agriculture, Dunedin.

THE chair illustrated was a sorry sight. Its cover was faded and ragged, the seat sagged where the webbing supporting 2 of the springs had given way, and the springs protruded miserably, dragging the torn webbing down with them. An attempt had been made to renew the webbing, but the second layer of webs had been merely stretched across the old, and not sewn to the springs, which had pushed out past them. The front legs wobbled, and the arms and back were hard to rest against, being but thinly covered with padding.

Replenishing the Padding

Remove the original cover from the outside of the back and arms of the chair, noticing how each was fastened. Use a tack remover if one is available; if not, a strong-handled, thin-edged screwdriver serves very well, assisted by pliers where necessary. These pieces are not used again in this position if a new cover is to be made, but are unlikely to be badly worn and may be used to extend the new material for the tuck-ins if they are not rotten. The old cover, and the padding cover if there is one, should also be freed and turned back to expose the padding along the tops of the back and arms.

Using upholsterer's flock or, better, "layer wool" (both obtainable fairly cheaply from a manufacturing upholsterer), repad the hard places on the arms and back. To keep the new flock in position, "tie" it to the backing material (or the spring cover if the back or arms are sprung) right through the old flock. Use fishing-twine ties and make long, overlapping back stitches, under which the flock is pushed in layers. By making the stitches overlap so that the layers of flock also overlap it is possible to make a smooth surface; separate stitches would mean separate lumps of padding with grooves between. The ties are put in as the flock is being arranged, and a little more flock spread over them, so that the finished surface is as smooth as possible. Do not break up the flock more than necessary, for the less it is broken at this stage the less likely are pieces of it to slip out of position later. The lower edge of the new flock must thin out smoothly down the arms and back to avoid a ridge between old and new padding. Try to pad the two arms as nearly alike as possible. The new flock will flatten down when the cover is put on and with use, so will not appear as bulky as it does at this stage.

When the new padding is satisfactory, draw up the old padding cover and retack it, with a minimum of tacks. As the material is sure to be somewhat rotten, draw up and tack the original cover so that the two together act as a stronger padding cover. They will be a little short, but may be fastened fairly near the edges provided the tacks will not pull out.

Some chairs may not have a separate padding cover, though all well-made chairs should do, and in this case the old cover should be well patched so that there is no danger of the flock working through it. In fact, patching the old cover may be necessary in any case unless the original padding cover is still quite strong and whole. The edges of the patches must not form ridges which may be felt through and will tend to wear the new cover.

Renewing the Webbing

Turn the chair upside down and rest the front edge of the seat on a chair. Remove the hessian webbing cover if there is one. If any of the webbing shows signs of wear, even if it is not torn, it should be replaced. Using the old webbing again is unwise, as if it is worn, it will have begun to rot, and probably will break quite soon when the chair is returned to use. New webbing is cheap, and may be bought by the yard at a furniture shop or an upholsterer's. Good-quality chair webbing should be bought, not the

The old chair . . .

. . . and the "new."

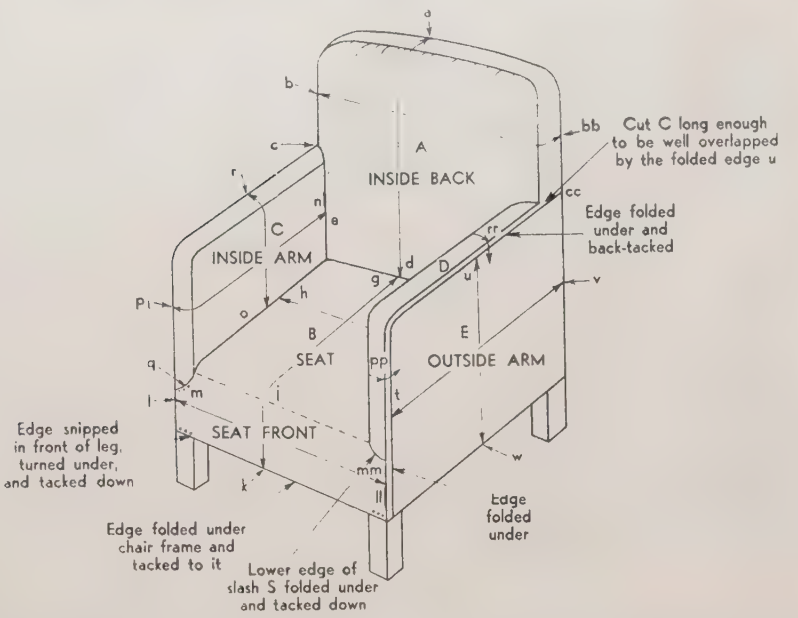

a
b
c
A
INSIDE BACK
bb
Cut C long enough to be well overlapped by the folded edge u
cc
r
n
e
C
INSIDE ARM
Edge folded under and back-tacked
rr
d
D
g
u
h
v
P
o
B
E
SEAT
pp
OUTSIDE ARM
q
m
i
t
l
Edge snipped in front of leg, turned under, and tacked down
SEAT FRONT
w
mm
k
ll
Edge folded under
Edge folded under chair frame and tacked to it
Lower edge of slash S folded under and tacked down

Fig. 1—The main cover pieces, showing where to take measurements and details of fitting.

thinner quality sold for binding the ends of mats. However, if only this thin webbing is available, buy it extra wide and fold both edges in to the middle, machining them to strengthen it.

The webs should be arranged so that 2 cross over each spring when it is vertical, but if the chair is a big one, or if there are only a few large springs, it is a good idea to use double webs throughout (Fig. 2). For a small chair single webs may be used. The area of the bottom of the chair should be divided fairly evenly by the webs, so if the springs are somewhat crowded toward the middle of the space, allow for extra webs between them and the outer edges. These will have no spring beneath them, but will help to support the webs that have. Allow for an extra 2in. on each web for turning under, or 3in. if there is to be no hessian webbing cover, and buy about 1ft. extra total length, as fastening the last web tightly is impossible if only the exact length has been allowed. Do not cut the webs to length first, but cut off each one only after it has been tightened.

Remove the tacks holding the old webbing, and cut the strings that fasten the springs to it. Buy a hank of fishing twine of about the same thickness as the old strings for resewing the springs to the new webbing. The same twine can be used for the "ties" which hold the new flock in position. As soon as the springs are freed they will expand and may be pushed aside while the new webs are being fastened. Be sure the springs are still well attached to the spring cover between them and the seat padding. If necessary, these stitches may be renewed with a semicircular upholsterer's needle, but the renewing of the spring cover itself is a major task involving the removal of all the seat padding.

Before the new webs are attached, any loose or wobbly joints in the chair frame should be repaired, as they are much easier to get at when the webs are absent and the springs may still be pushed out of the way. This work is described later in this article.

Attach the new webbing as shown in Fig. 3 and the photograph on the opposite page. For narrow or medium webs use 3 tacks for the first row and 4 for the second row; if a wide web is used, 4 and 5 tacks are better. For a big or medium-sized chair use ⅝in. tacks, but for one of light build ½in. tacks are quite strong enough, as the larger ones might split the wood.

When all the new webs are fastened, push the springs down under them and arrange each so that it is vertical and not touching its neighbour. Take several yards of twine and, using the upholsterer's needle (or, if one is not available, a fine bag needle), sew the wire ring base of each spring to the webbing. Instead of beginning with an ordinary knot, which might pull through, make a slip knot for the first stitch, and then sew and knot each spring in 4 or 5 places. The twine should go down through the webbing, round the wire, and up on the other side of it, which can be done with one movement if a semicircular needle is used. The twine is knotted each time through the stitch on top, as in buttonholing, before proceeding to the next stitch (Fig. 4). Do not cut off the twine after completing each spring, but carry on with the same piece. Should a new thread be necessary, knot it to the first piece instead of fastening it off and beginning again. As the webbing is tight and coarse, fastening off the end really securely is difficult, and only when all the springs are sewn should the final end of twine be fastened, which is best done with several buttonhole knots. (In the illustration on this page several of the springs have already been pushed under the webbing and sewn, though normally this would not be done until all the webs were fastened.)

Strengthening Joints and Legs

If joints have become loose and legs begun to wobble, merely glueing the loose parts together again is not usually satisfactory. Glue is insufficient to hold a joint the original fastening of which has not stood up to the strain of use. A steel bracket is usually far more satisfactory, and is cheap and not diffcult to attach. Squeeze the joint up tight; if necessary, clamp it in position unless it can be held fairly easily by someone else. Then mark the positions for the screws, ensuring that the bracket does not move while this is being done.

Drill the holes and screw the bracket into position. That is most easily done after removing the old webbing and before putting on the new, as the springs can then be pushed out of the way while the holes are being drilled. Be sure that any joint that has even begun to come loose is strengthened

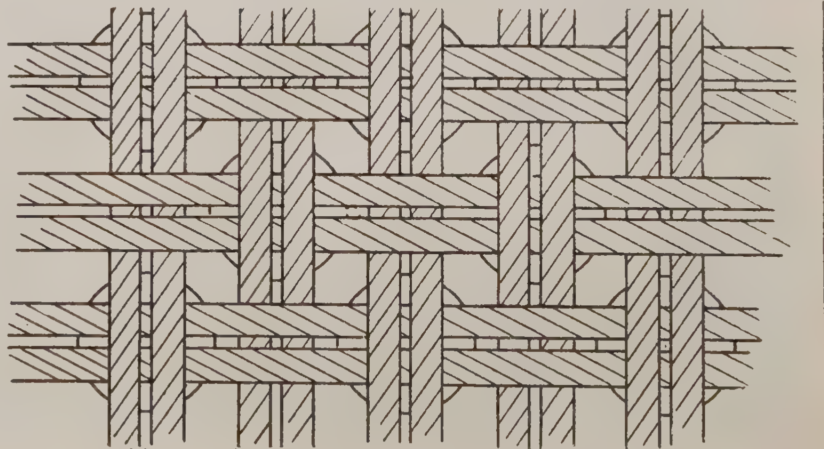


Fig. 2—The double webbing used for a large chair.

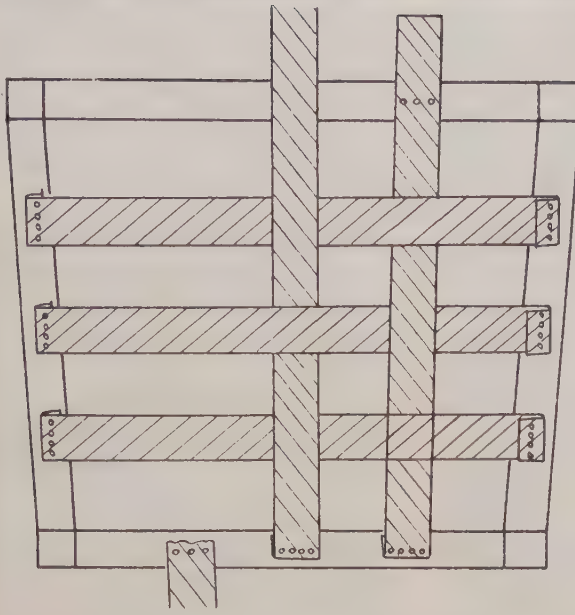
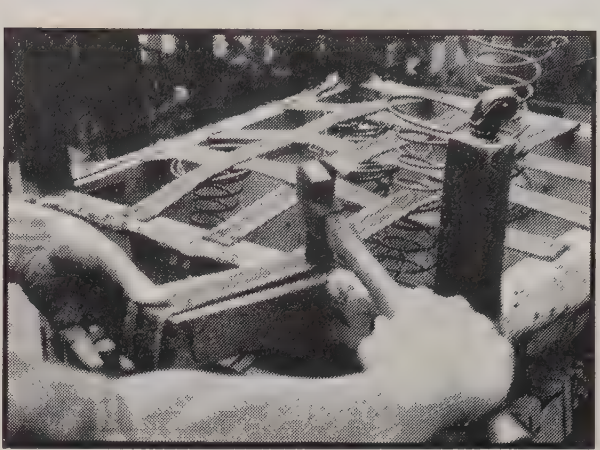


Fig. 3—Place the raw end of the webbing toward the inner edge of the chair frame and fasten it with 3 tacks. Turn the webbing over the tacks and raw edge and fasten it with 4 more tacks, 2 between the first ones and 1 on either edge. After tightening the webbing (as shown in the illustration on the right) and fastening it with 3 tacks, cut it off beyond the frame. Turn the edge over, once if the webs are to be covered with hessian, twice if not, and fasten the turned-over edge with 4 more tacks as before. Do not cut the web to length until it has been tightened.

ATTACHING AND TIGHTENING THE WEBBING



To tighten the webbing, first adjust the long end round a block of wood as shown so that it is taut round the block and pinched between it and the chair frame. The top of the block should be level with the frame of the chair or sloping up from it. Push tacks through the webbing in position to be hammered in, press down the outer end of the block until the web is so tight that it hums when plucked, then hammer the tacks down. Interlace the webs where they cross. Push the springs out of the way while fastening the webs; do not attempt to tighten them over the springs. Steel brackets for strengthening the legs of the chair are visible in the far inside corners.

in this way; do not wait for it to break before repairing it.

Making a New Cover

Before the making of a new cover can begin, the chair must be measured so that the amount of material required may be worked out. Fig. 1 shows where measurements should be taken and Fig. 5 the layout of the material. Examine the way the original pieces were arranged, and follow that for the parts not shown in the diagram. Allow for turnings, and wherever a piece "goes round a corner" allow plenty of material so that the raw edge may be covered easily by the piece that comes on top of it. Cut all pieces as rectangles in the first place. The following pieces are necessary:—

Inside back (A): This extends over the top at a and is tacked to the wooden bar of the chair frame behind. Allow sufficient to reach the bottom of this bar or it will be difficult to cover the raw edge completely later with the outside back piece, which must also be tacked to the bar, overlapping the edge of A. This is especially important if the chair back is higher in the middle than at the sides. Similarly, allow plenty to go round the sides at b and bb. The tuck-ins at e and f are continuations of b and bb, the widest part, and therefore need not be measured at this stage. For the tuck-in at d allow at least 2in. of cover material; other cheaper material may be machined on for the rest.

Seat (B): Treat the tuck-in at g in the same way as that at d. If the seat and seat front are all in the one piece (as in the chair illustrated), with no seam at j, allow sufficient width to fold round the sides at l and ll; that then allows enough for the tuck-ins at h and i. The cover folds under the chair front at k, where about 1½in. is necessary. Alternatively, there may be a seam at j, when B may be cut narrower, allowing only 2in. for tuck-ins at h and i, to be made wider later with extensions of cheaper material.

Inside arms (C and D): Allow plenty at r and rr, as at a, to reach right over the padding and down to the wooden framework, where the raw edge will be covered later by the outside arm pieces. About 1½in. is sufficient to fold back round the sides at p and pp, as here the wooden frame is not covered by padding. Allow a good 2in. tuck-in at o so that there is sufficient to reach low enough to be covered by the seat front at q. Allow another 2in. tuck-in at n.

Outside arms (E and F): Allow only about 1in. turnings at t and u, about 1½in. to turn under the chair at w, and about 2in. to go round the back at v. Allow 2 pieces each for inside and outside arms. As they are rectangular, it is not necessary to have a right and a left cut the opposite way of the material unless the pattern has a marked right and left design—for instance, a diagonal—which would look best sloping either forward or backward on both arms.

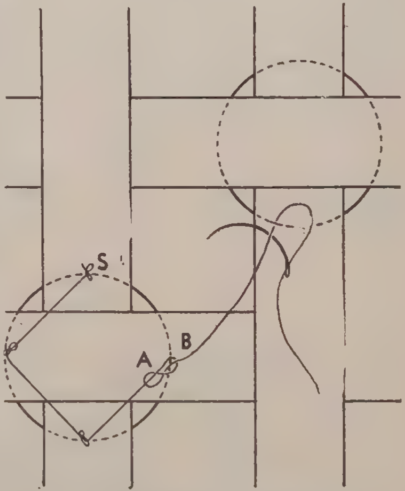
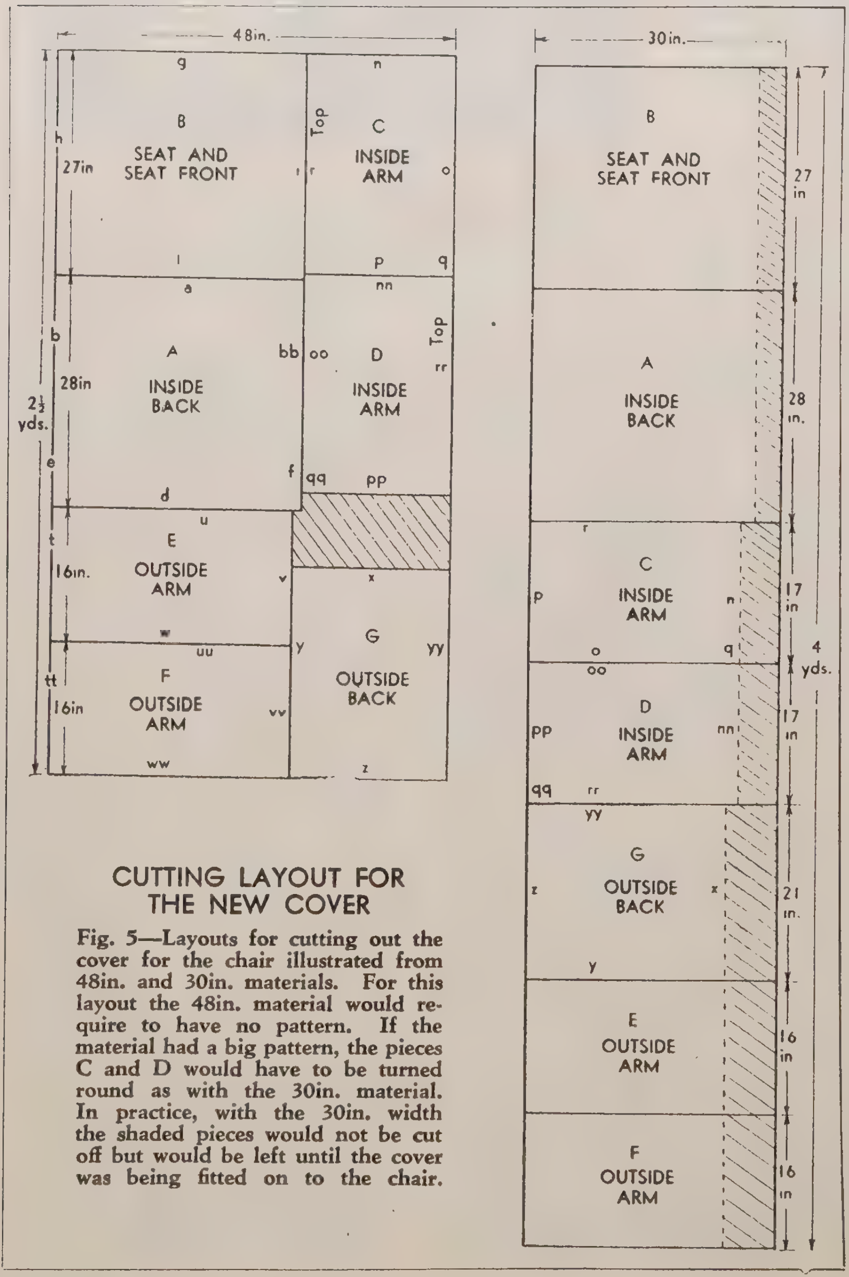


Fig. 4—Fastening a spring to the webbing. Begin with a slip knot at S and sew the spring to each web under which it passes. Knot the twine round each stitch as shown, first pulling the loop A tight and then the twine B. Continue on to the next spring without cutting the twine. If possible, use a sufficient length of twine to enable all the springs to be sewn with the same piece.

Outside back (G): This piece must be big enough to overlap the raw edges of the back and outside arm pieces and the tacks that hold them, and should have about 1in. turnings allowed along the top and down the 2 sides. Along the bottom edge, where it is turned under the chair, allow about 1½in.

These are all the pieces required for small chairs with narrow arms and back. If the arms and back are sprung, or if the arms are very much thicker than those shown, an extra piece will be needed up the front of each and possibly up each side of the back. The original chair cover should be copied in this respect.

Having carefully taken the measurements of all the required pieces, the amount of material needed must be worked out. Plan how to obtain the pieces out of a given width most economically by sketching a layout as in Fig. 5. If the material is patterned, be sure that all pieces are the right way round, and if the pattern is large, it must be centred on each of the main areas—the back, seat, and inside arms at least. That will necessitate the use of more material. In the diagram the pieces C and D are cut from the 48in. cloth so that the selvedge runs from front to back of the chair instead of up and down, which would be possible only with plain material or one with a very small pattern, as in the photographs. For cloth with a big pattern the 30in. width would be more economical, and in practice all the pieces would be cut the full width of the cloth whether they needed to be quite as wide as that or not, so that the pattern would be centred, and the extra would be trimmed off as necessary as the cover was being fitted to the chair. Unless a single width of the material was sufficient for the widest piece of the cover, the 30in. cloth would not do.



CUTTING LAYOUT FOR THE NEW COVER

Fig. 5—Layouts for cutting out the cover for the chair illustrated from 48in. and 30in. materials. For this layout the 48in. material would require to have no pattern. If the material had a big pattern, the pieces C and D would have to be turned round as with the 30in. material. In practice, with the 30in. width the shaded pieces would not be cut off but would be left until the cover was being fitted on to the chair.

Pattern pieces may be cut out in paper and the most economical layout planned with these. They may then be used as a cutting guide when the material is bought. All pieces should be cut in rectangles, even though that means a little wastage; the amounts wasted are small and would be of little value.

Before fitting the new cover on to the chair, work out how much extra must be added to all the tucked-in edges by comparing it with the original cover. It will be seen that the extra pieces need not be the full width of the cover pieces to which they are to be machined. Unless it is rotten, the material which originally covered the outside back and arms of the chair can well be used for these tuck-ins. Alternatively, use a strong, cheap material such as calico or hessian.

Attaching the Cover

Begin the attachment of the new cover with the inside back (A), placing it in position so that the same amount extends on either side, and sufficient is left at the top to reach right over the padding and be tacked to the wooden frame well toward its lower edge. The centring of the cover is easier if the centre back line of the chair is marked, the cover piece folded or marked down its middle, and the two centre lines matched. When that has been done and the top fold-over checked, pin or stitch the cover to the chair, preferably down the centre line. Then tack down the top through the single material in about three places, but not more until the bottom is held firmly.

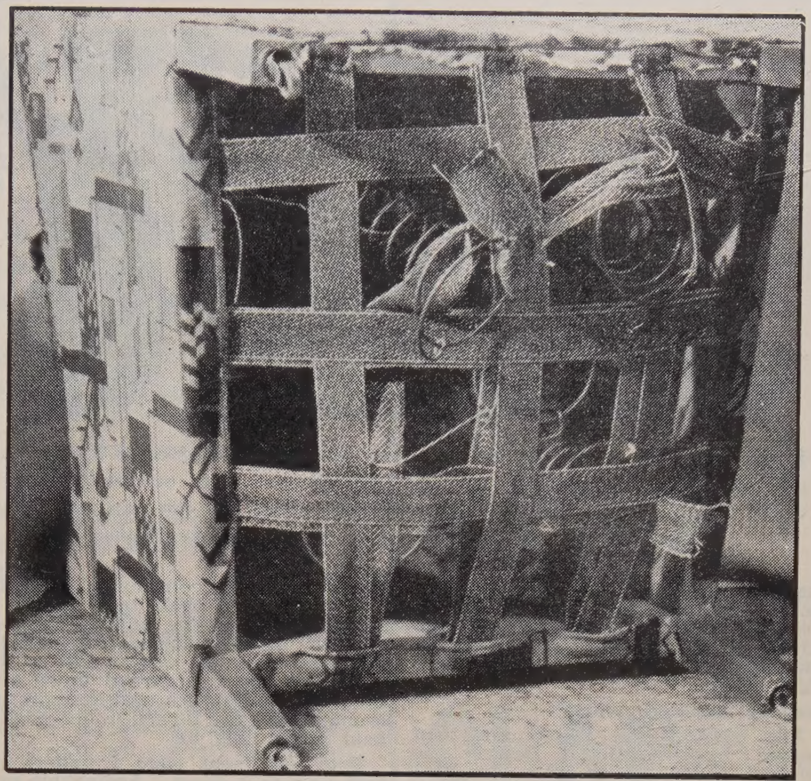
Tuck in the lower edge, and, if necessary, cut a piece right out of each bottom corner so that the side edges may be tucked in smoothly. Do not cut out too much at once, but keep on fitting and cutting a little at a time. Instead of cutting all the extra material right out, cut the last inch or 2 diagonally and fold the edges under (Fig. 6), thus avoiding raw edges. The cover should finally fit smoothly and be free from wrinkles when pulled taut between back and seat and between back and arms.

Do not tack these tuck-ins until the side edges are fitted round the junction of each arm with the back (c). This is not an easy place to fit. If in doubt about how to cut the material, remove the tacks holding this part of the original cover, pull it out, and examine how it was done. Each cut slants up from the outside edge, then curves down over the arm. The part below this may be cut away (Fig. 6). The upper part (bb) of the back cover must fold smoothly round the chair and extend low enough at c for the raw edge to be covered later by the inner arm piece D and, on the outside, by the outer arm piece E. As E must be tacked to the wood beneath the stuffing along the top of the arm, its upper edge (u) reaches only to within an inch or two of the arm, so be sure to leave the little flap c long enough to be overlapped by u.

When both sides have been fitted satisfactorily, pull all the tuck-ins through to their final positions, and tack them firmly through a folded edge on top of the old cover. Then tack b and c round the sides through the raw edge and make little pleats in the cover to fit it smoothly at the top corners. Try to pleat the 2 corners to match each other. Finish tacking down the top edge a.

Inside Arm Pieces (C and D)

The inside arm pieces should be smoothed into position and fastened as was the back. The corner between the bottom and back tuck-ins (between o and n) is treated as were the lower corners of the back cover. The upper part of the edge n is turned under and covers the raw edge of c. Both these edges are pulled into the crack between arm and back padding as much as possible. The top edges (r and rr) are pulled firmly over the padding and tacked well down on the wooden frame beneath it through the raw edge. This edge has to be covered later by the outside arm piece, so bring it to the lower edge of the wooden bar, allowing for plenty of overlap later when u covers it. The material has to be pleated again to fit smoothly over the front of each arm, and the pleats on the 2 arms should be made to match as nearly as possible. A tack or two holding the underneath pleats in position is a good idea provided they are covered up later. The bottom front corner must again be slashed to fit over the chair frame, somewhat as at c on the back cover. Again, the raw edges of this slash should be turned under for strength, and the lower edge in front (q) may be tacked down, as this edge will later be overlapped by the seat cover (m and mm). If in difficulties, undo the original cover as before to see how it was cut and fitted. When the fitting is completed, tack down all 4 edges on top of the old cover. The edges of the tuck-ins o and n should be turned under and tacked through double material.



An underneath view of the chair before repairs were undertaken. The webbing supporting some of the springs had given way, and the springs protruded, dragging the torn webbing with them. An attempt had been made to renew the webbing, but the second layer of webs had been merely stretched across the old ones and not sewn to the springs, which had pushed out past them.

Seat Cover (B)

The seat cover is also centred, smoothed down, and fastened before any fitting of corners or tuck-ins is begun. Then the back corners are fitted, being cut out and the edges turned under as for the other corners that were between 2 tuck-ins. The side edges are slashed (Fig. 7s) parallel to the front bottom edge and sufficiently far from it to allow the seat front to be covered completely and the lower edge of the slash to be folded under across the base of each arm. The point of the slash is curved back so that it may be pulled well down into the crack between seat and arm stuffing, and care must be taken not to cut too far into the material here. The back edge of the slash is folded under, or a small piece cut right out if necessary, and the side tuck-in h pushed down into position.

The folds m and mm are held with 3 neat small-headed tacks or sewn down, preferably with a semicircular needle; to sew them without such a needle is very difficult. The bottom edge k is tacked underneath the chair, and a small cut made by each leg, so that in front of the leg itself the

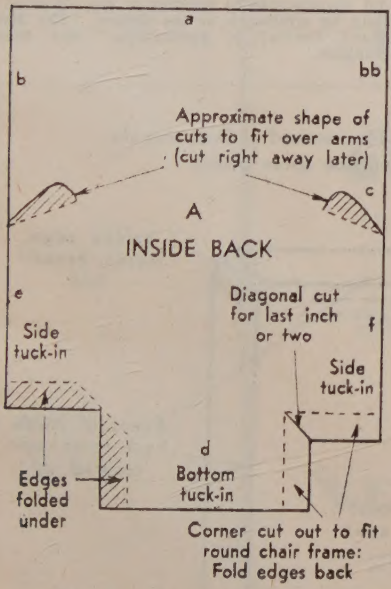

a
b
bb
Approximate shape of cuts to fit over arms (cut right away later)
c
A
INSIDE BACK
e
Diagonal cut for last inch or two
f
Side tuck-in
Side tuck-in
d
Bottom tuck-in
Edges folded under
Corner cut out to fit round chair frame: Fold edges back

Fig. 6—How the back piece will look when cut to fit. These cuts must be made while the material is being fitted to the chair.

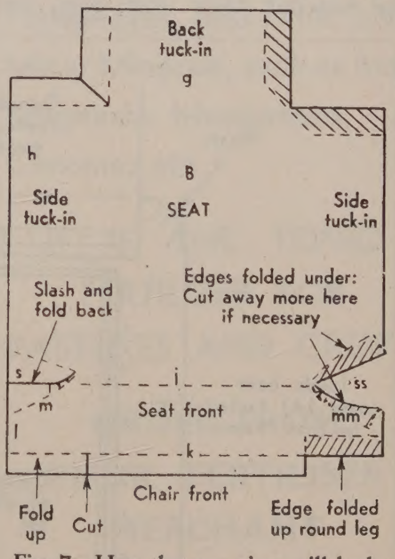
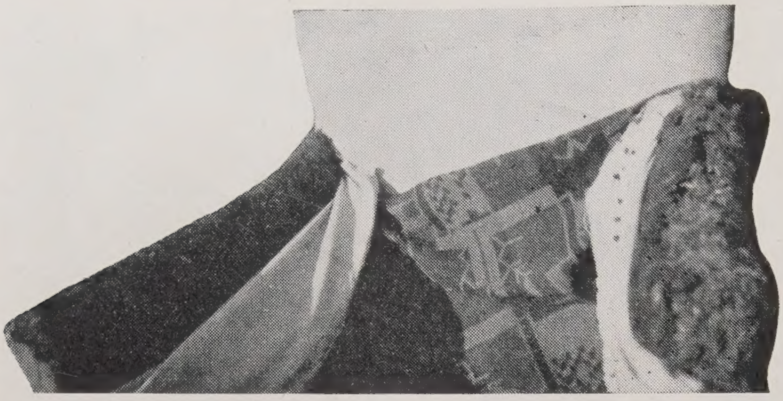

Back tuck-in
g
h
B
Side tuck-in
SEAT
Side tuck-in
Edges folded under: Cut away more here if necessary
Slash and fold back
s
i
ss
m
Seat front
mm
l
k
Chair front
Fold up
Cut
Edge folded up round leg

Fig. 7—How the seat piece will look when cut to fit. It must be cut and fitted only after the cover has been anchored to the chair seat.

REPAIRING AN UPHOLSTERED CHAIR



If the arms need repadding, the old cover, and the padding cover if there is one, should be freed and turned back. Upholsterer's flock or, better, "layer wool" can be used to repad the hard places. Here the left arm has been repadded and the other is still in its original condition.

material is folded under and again held with 2 or 3 small tacks. The lower edge of this fold must be in line with the bottom edge of the chair, so that the material makes a straight line right across.

Outside Arms (E and F)

The outside arm pieces are then tacked into position. Before the original cover pieces were removed the top edge of each was held by tacks under the folded edge. To do this, hold the material in position, then turn it back over the arm so that it is wrong side out and upside down, the edge u lying on top of the edge rr. Be sure there will be sufficient at the front to turn under at t when the material is folded down into its correct position again, and also enough at the back (v) to extend round to the back. Put 1 or 2 tacks into the edge u, fold the material down over them, and check this before continuing. With the material turned back, tack a strip of cardboard along the edge u (that is, on top of the wrong side of the material, raw edge downward) so that when the cover is turned down over the cardboard strip a neat straight fold is made and the turned-under edge is held firmly (Fig. 8).

Fold the front edge t under, and tack or sew it down. Again, this sewing is almost impossible without a semicircular needle. Turn the edge v round the back of the chair, and tack it down on the single edge. This will be covered by the outside back piece, so do not fasten it too near the outer edge. Treat the bottom edge as at the front.

Outside Back (G)

Finally the outside back piece is tacked on. The top edge is "back-tacked" with a strip of cardboard (Fig. 8) like the top edges of the outside arm covers, and the 2 side edges turned under and tacked or sewn down. The lower edge is again turned under the chair and snipped to fit the legs.

Finishing Touches

The new cover is then complete, but a piece of hessian or calico may be cut to fit the bottom of the chair and tacked down over the springs and webbing, covering all the raw edges of the bottoms of the cover pieces. This keeps the dust out of the springs, protects the stitches with which the springs are sewn to the webbing, and generally makes a neat finish to the "new" chair. The edges of this webbing cover should be turned under and the tacks put through the double folded edge.

If the chair has castors, these should be cleaned, oiled, and wiped before the chair is put back into service.

"Cuffs" to protect the arms may be made of small pieces of cover material. These are made of 1 or 2 pieces to fit as neatly as possible over the front of each arm where most of the wear will come. The outer edge is hemmed all round and the cuffs are fastened to the chair with domes or hooks and eyes. These are well worth while making, as they can be taken off and washed frequently, and can be renewed much more simply than the whole of the chair cover when they wear out.

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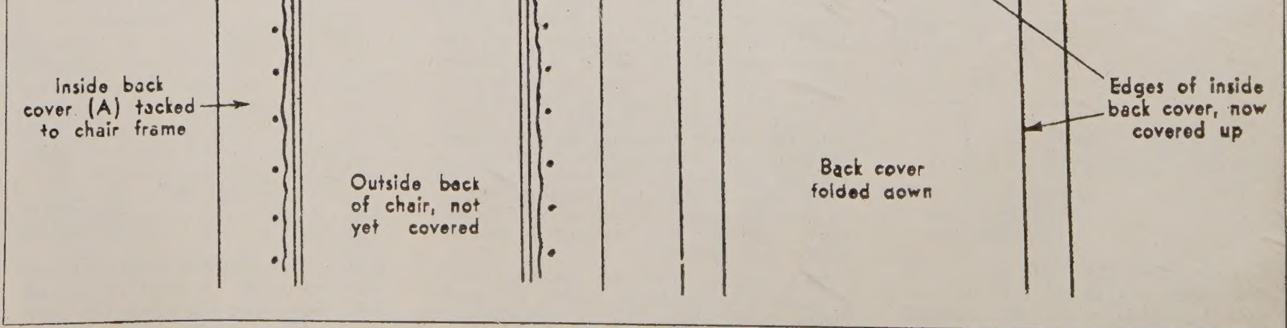

Fig. 8—The method of fastening the outside cover pieces.

Pleats
Outside back cover (G) turned up
Cardboard strip back-tacked over raw edge
Folded edge, tacked beneath fold
Inside back cover (A) tacked to chair frame
Outside back of chair, not yet covered
Back cover folded down
Edges of inside back cover, now covered up

Printed by Blundell Bros. Ltd. (The Evening Post), Wellington—26981

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1. Any unusual lump or thickening, especially in the breast.
2. Any irregular bleeding or discharge from any body opening.
3. Any sore that does not heal—particularly about the tongue, mouth or lips.
4. Persistent indigestion, often accompanied by loss of weight.
5. Sudden changes in the form, colour or rate of growth of a mole or wart.
6. Any persistent change from the normal habit or action of the bowels.

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